V Workstation Imaging

The following sections provide information on Novell® ZENworks® for Desktops (ZfD) 4/SP1/4.0.1 Workstation Imaging procedures and features.

- Chapter 39, “Common Imaging Deployment Strategies,” on page 439
- Chapter 40, “Preparing an Imaging Server,” on page 443
- Chapter 41, “Setting Up Workstations for Imaging,” on page 445
- Chapter 42, “Setting Up Imaging Policies,” on page 457
- Chapter 43, “Performing Basic Imaging Operations,” on page 461
- Chapter 44, “Setting Up Disconnected Imaging Operations,” on page 465
- Chapter 45, “Preparing Images,” on page 469
- Chapter 46, “Multicasting Images,” on page 475
- Chapter 47, “Imaging Utilities and Options,” on page 479
- Chapter 48, “Supported Ethernet Cards,” on page 505
- Appendix D, “Documentation Updates,” on page 513

39 Common Imaging Deployment Strategies

The following overview sections present possible approaches to deploying Novell® ZENworks® for Desktops imaging services for some common enterprise scenarios. Use the following sections to determine which procedures (documented in subsequent sections) to perform and in what order:

- "Installing a Standard Image Before Deploying New Workstations" on page 439
- "Enabling Existing Workstations for Future Reimaging" on page 440
- "Reimaging Corrupted Workstations" on page 440
- "Restoring Lab or Classroom Workstations to a Clean State" on page 441

Installing a Standard Image Before Deploying New Workstations

As new computers are purchased, before deploying them you can install a standard software platform and enable the computer for future unattended reimaging.

1. Create a model workstation of each type that you'll deploy, and create an image of each on a ZENworks for Desktops Workstation Imaging server. For more information, see "Manually Taking an Image of a Workstation" on page 462. These images should include the Imaging Agent and either the Novell Client™ or ZENworks for Desktops Management Agent. ZENworks for Desktops lets ZENworks work with or without an installation of the Novell Client on the workstation. If your setup does not require the client, then the Management Agent must be installed. For more information, see Installing the ZfD Management Agent on a Workstation in the *ZENworks for Desktops 4.0.1 Installation Guide*.
2. Create imaging boot diskettes or CDs that point to the ZENworks for Desktops Workstation Imaging server where the model images are stored (not required if you are using Preboot Services). For more information, see "Preparing an Imaging Boot Device or Method" on page 445.
3. Create a policy for unregistered workstations that specifies which image to put on a new machine, depending on its hardware. For more information, see "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 457.
4. If you are using Preboot Services, install ZENworks for Desktops Preboot Services (PXE Support) on your imaging server. For more information, see ZENworks for Desktops 4 Preboot Services PXE-on-Disk User Guide.

As each new computer comes in, do the following:

1. If you are using Preboot Services, check to see if the workstation is PXE capable. Enable PXE if it isn't enabled by default. For more information, see "Preboot Services (PXE)" on page 445.
2. Physically connect the workstation to the network. If you are using Preboot Services, boot it from the Imaging/Preboot Services server. If you are not using Preboot Services, boot it with the imaging boot diskettes or CD and install the ZENworks for Desktops Workstation Imaging

(Linux*) partition. For more information, see Step 6 on page 454 of "Enabling a Workstation for Auto-Imaging Operations" on page 452.

3. Reboot from the ZENworks for Desktops imaging partition (not required if you are using Preboot Services).
4. Let the computer be auto-imaged by the policy.
5. After deploying the machine, register it as a Workstation object in Novell eDirectory™. For more information, see "Automatic Workstation Import and Removal" on page 59.

Enabling Existing Workstations for Future Reimaging

With minimal disruption to users, you can enable existing workstations for possible future reimaging.

This might need to be phased in by local administrators. Each administrator could do the following:

1. Upgrade each workstation to the latest Novell Client, using Automatic Client Update. Or, install the ZENworks for Desktops Management Agent. ZENworks for Desktops lets ZENworks work with or without an installation of the Novell Client on the workstation. If your setup does not require the client, then the Management Agent must be installed. For more information, see Installing the ZfD Management Agent on a Workstation in the *ZENworks for Desktops 4.0.1 Installation Guide*.
2. Install the ZENworks for Desktops Imaging Agent on each workstation by distributing an Application object. For more information, see Step 4 on page 453 of "Enabling a Workstation for Auto-Imaging Operations" on page 452.
3. Register each workstation as a Workstation object in eDirectory. For more information, see "Automatic Workstation Import and Removal" on page 59.
4. If the workstations are PXE capable, make sure PXE is enabled (see "Preboot Services (PXE)" on page 445) and make sure that ZENworks for Desktops Preboot Services (PXE Support) has been installed on your imaging server (see ZENworks for Desktops 4 Preboot Services PXE-on-Disk User Guide). Or, prepare a few sets of imaging boot diskettes or CDs that users can use when they run into trouble (see "Preparing an Imaging Boot Device or Method" on page 445). These devices could point to an imaging server that contains the same clean images used for new computers.
5. If a user runs into trouble, use the strategy for reimaging corrupted workstations.

Reimaging Corrupted Workstations

Without data loss or undue disruption to users, you can fix workstations that have become misconfigured or corrupted.

1. Create a policy for registered workstations. Use the same image-selection logic as the policy for new (unregistered) workstations. For more information, see "Defining an Imaging Policy for Registered Workstations (Workstation Policy)" on page 459.
2. When a computer needs to be fixed, have the user back up (to the network) any files that he or she wants to keep.
3. Flag the Workstation object in eDirectory to receive an image the next time it boots. For more information, see "Triggering an Unattended Imaging Operation" on page 461.

4. Have the user reboot. If it's an older workstation (without a ZENworks for Desktops Workstation Imaging (Linux) partition), the user should boot with the imaging boot diskettes or CD. If it's a newer workstation (with a ZENworks for Desktops imaging partition or PXE-enabled), the user should boot from the ZENworks for Desktops imaging partition or Imaging/Preboot Services server. If you are using Preboot Services, make sure ZENworks for Desktops Preboot Services (PXE Support) has been installed on your imaging server. For more information, see ZENworks for Desktops 4 Preboot Services PXE-on-Disk User Guide.
5. Restore any user files that were backed up in Step 2.

Restoring Lab or Classroom Workstations to a Clean State

After each lab session, you can restore every workstation to a clean state, removing any changes or additions made during the session.

1. Create an image of a clean model workstation and store it on a ZENworks for Desktops Workstation Imaging server. For more information, see "Manually Taking an Image of a Workstation" on page 462. The image should include the Imaging Agent and either the Novell Client or ZENworks for Desktops 4 Management Agent. ZENworks for Desktops lets ZENworks work with or without an installation of the Novell Client on the workstation. If your setup does not require the client, then the Management Agent must be installed. For more information, see Installing the ZfD Management Agent on a Workstation in the *ZENworks for Desktops 4.0.1 Installation Guide*.
2. Create imaging boot diskettes or CDs that point to the ZENworks for Desktops Workstation Imaging server where the clean image is stored. For more information, see "Preparing an Imaging Boot Device or Method" on page 445. If you are using Preboot Services and the workstations are PXE capable, make sure PXE is enabled. For more information, see "Preboot Services (PXE)" on page 445.
3. If you are using Preboot Services, make sure ZENworks for Desktops Preboot Services (PXE Support) has been installed on your imaging server. For more information, see ZENworks for Desktops 4 Preboot Services PXE-on-Disk User Guide.
4. Create a policy for unregistered workstations that specifies the clean image to restore. Choose the option to always force down the same base image. For more information, see "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 457.

Deploy each lab computer as follows:

1. Physically connect the workstation to the lab network. If you are using Preboot Services, boot it from the Imaging/Preboot Services server. If you are not using Preboot Services, boot it with the imaging boot diskettes or CD and install the ZENworks for Desktops Workstation Imaging (Linux) partition. For more information, see Step 6 on page 454 of "Enabling a Workstation for Auto-Imaging Operations" on page 452.
2. Reboot from the ZENworks for Desktops imaging partition (not required if you are using Preboot Services).
3. Reboot from the ZENworks for Desktops imaging partition (not required if you are using Preboot Services).
4. At the end of each lab session, reboot each computer and let it be auto-imaged by the policy.

40 Preparing an Imaging Server

The following are the requirements for the imaging server:

Requirement	Explanation
A fixed IP address	When you connect to the imaging server during a workstation imaging operation, you must do so using the fixed IP address or DNS name of the imaging server.
Enough space to store a workstation image	Unless you use compression (which is enabled by default) for your workstation images, they are nearly the same size as the data on the workstation hard disk, which could be hundreds of MB.
The Imaging and Automatic Workstation Import components of ZfD installed	These software components enable the server to act as an imaging server and to register workstations in NDS® or Novell® eDirectory™ for auto-imaging (unattended) operations. If you have already done a typical ZfD installation on the server, the server is ready to act as an imaging server. If not, use the following steps to install the needed components: 1. Make sure your server meets the requirements specified in Preparing for the ZfD Server Installation in the *ZENworks for Desktops 4.0.1 Installation Guide* guide. 2. Run the ZfD installation program (winsetup.exe) either on your server (Windows NT/2000/XP) or from a Windows workstation with a drive mapped to your server (NetWare®). 3. When prompted for the NDS or eDirectory tree to install to, choose the tree that your server is in. 4. When prompted for the components to install, choose Automatic Workstation Import and Imaging. 5. When prompted for the import/removal role, choose Import. 6. If you are installing Preboot Services (PXE), select this component when prompted. 7. When the installation is done, restart your server.

If you want to store an image locally (on a CD, hard disk or Jaz* drive) rather than on an imaging server, see “Using a CD” on page 465 and “Using a Hard Disk or Jaz Drive” on page 466 in Chapter 44, “Setting Up Disconnected Imaging Operations,” on page 465.

41 Setting Up Workstations for Imaging

The following sections cover procedures to prepare workstations for imaging. The procedures that are applicable to you depend on your imaging deployment strategy. For more information, see Chapter 39, "Common Imaging Deployment Strategies," on page 439.

- "Preparing an Imaging Boot Device or Method" on page 445
- "Preparing a Workstation for Imaging" on page 451
- "Imaging a Server" on page 455

Preparing an Imaging Boot Device or Method

The Novell® ZENworks® for Desktops (ZfD) imaging engine that performs the actual imaging of the workstation is a Linux application. Therefore, the workstation must be temporarily booted to Linux while the imaging is performed.

Unless you use Preboot Services, you need to prepare a boot device that has the Linux kernel, ZfD Workstation Imaging engine, and network drivers installed. The boot method you use can be any of the following:

- "Preboot Services (PXE)" on page 445
- "Diskettes" on page 446
- "CD" on page 448
- "Hard-Disk Partition" on page 448

This section also contains information about adding Linux drivers to your boot device or method, and information about booting to Linux with a non-English keyboard. For these topics, see "Additional Information About Booting to Linux" on page 449.

Preboot Services (PXE)

PXE (Preboot Execution Environment) is an industry-standard protocol that allows a workstation to boot up and execute a program from the network before the workstation operating system starts. PXE uses DHCP (Dynamic Host Configuration Protocol) and TFTP (Trivial File Transfer Protocol). The PXE environment is loaded from either the NIC in flash memory or read-only memory, or in the same memory as the system BIOS.

ZfD 4 Preboot Services uses PXE to find out if there is imaging work specified for a workstation and to provide the workstation with the files necessary to boot to the ZfD imaging environment.

Before you can use Preboot Services, you need to do the following:

- Install the ZfD 4 Imaging and Preboot Services (PXE Support) components on your imaging server.

- Enable PXE on the workstation
- Have a standard DHCP server, either on your imaging server or on another network server.

For information about requirements, installation, deployment, and administration of Preboot Services, see the ZfD 4 *ZENworks for Desktops 4 Preboot Services Installation and Configuration Guide* guide. You can access this guide during the ZfD 4 installation by clicking Installation > Preboot Services Documentation.

If You Have Previously Installed a ZfD Workstation Imaging (Linux) Partition

If you decide to use Preboot Services but have previously installed a ZfD imaging partition on the workstation, you can disable or delete the partition. You can disable (and enable) the ZfD imaging partition when you boot to Linux using any imaging boot device or method. You can delete the ZfD imaging partition only when you are putting an image on the workstation using standard imaging, and only when you boot the workstation from an imaging boot device or method other than the ZfD imaging partition.

IMPORTANT: After you have deleted the ZfD imaging partition, you need to make sure that the image you put on the workstation was made on a computer without a ZfD imaging partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the computer will fail to boot. In addition, if you remove the ZfD imaging partition from a Windows NT 4, Windows 2000, or Windows XP machine, Windows will no longer be able to boot. You should only remove the ZfD imaging partition if you are going to restore an image to the workstation.

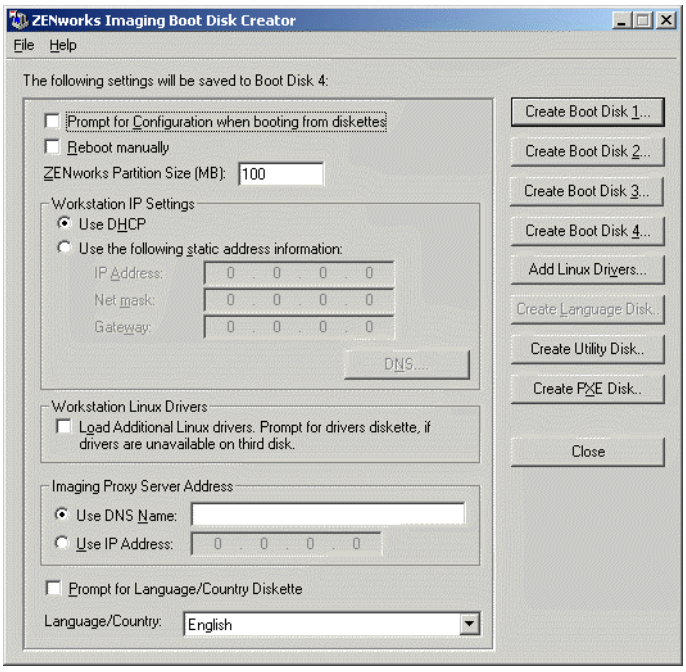
Diskettes

Imaging boot diskettes are an easy device to prepare. Four diskettes are required, five if you need to image computers that have non-English keyboards.

Creating Imaging Boot Diskettes

1. Format four high-density diskettes, or use preformatted blank diskettes. If you need the imaging boot diskettes to include support for booting your test workstation with a non-English keyboard, you'll need a fifth diskette.
2. Browse to the zenworks\imaging folder in your ZfD installation (on the imaging server) and run zimgboot.exe.

   TIP: You can also start zimgboot.exe in ConsoleOne® by clicking Tools > ZENworks Utilities > Imaging > Create or Modify Boot Diskette.



3. On the screen that appears, near the bottom under Imaging Proxy Server Address, enter either the fixed IP address or the full DNS name of your imaging server.
4. For the other fields and options on the screen, keep the default settings unless you have a specific reason to change a setting, such as to include support for a non-English keyboard. Click Help for details on specific settings.
5. Click Create Boot Disk 1 > insert the first diskette > click OK.
6. When the first diskette has been created, click Create Boot Disk 2 > insert the second diskette > click OK.
7. When the second diskette has been created, click Create Boot Disk 3 > insert the third diskette > click OK.
8. When the third diskette has been created, click Create Boot Disk 4 > insert the fourth diskette > click OK.
9. If you need the imaging boot diskettes to include support for a non-English keyboard: When the fourth diskette has been created, click Create Language Disk > insert the fifth diskette > click OK. Otherwise, skip this step. For more information, see "Booting with a Non-English Keyboard" on page 451.
10. When the last (fourth or fifth) diskette has been created, click Close.

After you have created the diskettes, you can customize them for the particular imaging tasks for which you will use them, such as one set of diskettes for connecting to a server that holds Windows 2000 images, another set for connecting to a server that holds Windows NT 4 images, and another set for installing ZfD Workstation Imaging (Linux) partitions. To customize the diskettes, edit the settings.txt file on the fourth diskette as explained in Chapter 47, "Imaging Utilities and Options," on page 479.

When you boot a workstation using imaging boot diskettes, you are prompted when to insert the second, third, and fourth diskettes, and when to insert the language diskette (if you created one).

NOTE: You can also use the Imaging Boot Disk Creator (zimgboot.exe) to create a diskette that contains Linux utilities. See the Help in the Boot Disk Creator for more information.

CD

If you have CD-burning software, you can create an imaging boot CD for performing imaging operations. This is a bit harder than preparing imaging boot diskettes, but you have more room to store any custom files that you might want to add, such as images and Linux device drivers.

Preparing an Imaging Boot CD

If you have CD-burning software, you can use the bootcd.iso image available on the ZfD Workstation Imaging server to create an imaging boot CD.

To create an imaging boot CD:

1. In a temporary working area, create a settings.txt file containing the settings you want for the imaging bootup process. For more information, see Chapter 47, "Imaging Utilities and Options," on page 479.
2. Use the Add Linux Drivers button in the Imaging Boot Disk Creator (zimgboot.exe) to copy the Linux drivers to a diskette. Copy the a:\drivers directory from the diskette to the temporary working area mentioned above.

   For more information about adding Linux drivers, see the online help for the Imaging Boot Disk Creator or see "Using Zimgboot.exe to Add Linux Drivers" on page 484.
3. In the temporary working area, add any ZfD image files you want to store on the CD.
4. Use your CD-burning software to burn the bootcd.iso image onto the CD. This image is located in the zenworks\imaging folder in your ZfD installation (on the imaging server).
5. Use your CD-burning software to add the contents of your temporary working area to the root of the CD, including the settings.txt file, any Linux network drivers, and any ZfD image files.

   IMPORTANT: Adding these files makes the CD a multisession CD. To boot a workstation from such a CD, the CD drive must support multisession CDs. For example, in our testing, we successfully booted an HP* vectra VL, a Compaq* Prosignia, and a Dell Optiplex, but some other workstations failed, including an IBM* PC 300PL, a Dell Dimension XPS T450, and an IBM clone with an Intel* motherboard.

   If you can't create a multisession CD or you are using a drive that does not support multisession CDs and you don't need to store the image or Linux drivers on the CD, you can still create an imaging boot CD. Create the CD from the bootcd.iso file as in Step 4 on page 448. Also create imaging boot diskettes as explained in "Creating Imaging Boot Diskettes" on page 446. Boot the workstation using the CD. When you are prompted for settings.txt, insert the fourth imaging boot diskette in the diskette drive.
6. Use your CD-burning software to finalize the CD.

For information on how to use the CD to perform disconnected imaging operations, see "Setting Up Disconnected Imaging Operations" on page 465.

Hard-Disk Partition

If you want to set up a computer for unattended imaging operations and are unable to use Preboot Services (PXE), you must create a ZfD Workstation Imaging (Linux) partition on the hard disk. If you make the partition big enough, you can even store an image of the computer's hard disk, which can be useful if (for example) the computer becomes misconfigured or corrupted.

To create a ZfD imaging partition, you must first create imaging boot diskettes and boot the computer from them. Then, proceed with Step 5 of "Enabling a Workstation for Auto-Imaging Operations" on page 452.

Additional Information About Booting to Linux

The following sections contain additional information:

- “Adding Linux Device Drivers” on page 449
- “Booting with a Non-English Keyboard” on page 451

Adding Linux Device Drivers

If you need to, you can add Linux device drivers to your boot device or method.

- “Obtaining Linux Drivers” on page 449
- “Adding Linux Drivers to Your Boot Device or Method” on page 449

Obtaining Linux Drivers

To obtain a Linux driver for your particular hardware, you should visit the Web site of the hardware vendor and check for a download location.

There are also some other Web sites where you can obtain drivers:

- Network drivers can be downloaded from the Scyld Computing Corporation* (http://www.scyld.com). Click Network Drivers.
- PCMCIA drivers can be downloaded from the Linux PCMCIA Information Page (http://pcmcia-cs.sourceforge.net).

You can also get additional Linux drivers at the ZENworks Cool Solutions Web Community (http://www.novell.com/coolsolutions/zenworks/features/a_linux_drivers_zw.html).

To learn more about drivers, including the loading parameters you need to specify, see the Linux Documentation Project (http://www.linuxdoc.org) and visit the following HOWTO (http://www.linuxdoc.org/HOWTO/HOWTO-INDEX/howtos.html) sites:

- Hardware
- PCMCIA
- SCSI
- Ethernet

Adding Linux Drivers to Your Boot Device or Method

Diskettes

For information, see “Using Zimgboot.exe to Add Linux Drivers” on page 484.

CD

For information, see “Preparing an Imaging Boot CD” on page 448.

Hard-Disk Partition

It is unlikely that you will need to add Linux drivers if you are using a ZfD Workstation Imaging partition. If you want to update the Linux drivers, however, follow this procedure:

1. Boot the workstation using imaging boot diskettes, an imaging boot CD, or if it is PXE-enabled, boot it from the Imaging/Preboot Services server.

2. Enter **manual** at the boot prompt or select Start ZENworks Imaging in Maintenance Mode from the PXE menu.
3. Enter the following to mount the hard drive:

   ```
   mount /dev/hda1 /mnt/harddisk
   ```

4. Enter the following to mount the diskette that contains the driver files:

   ```
   mount /dev/fd0 /mnt/floppy
   ```

5. Enter the following to copy the files to the appropriate directory on the ZfD imaging partition:

   ```
   cp /mnt/floppy/*.o /mnt/harddisk/lib/modules/2.4.3/drivers/net
   ```

6. Type **reboot** > press Enter.

Preboot Services (PXE)

To add Linux drivers for use with Preboot Services, you must have a working Linux workstation capable of mounting a loop device. Red Hat* 7 has this ability compiled in the distribution kernel.

1. On the TFTP server on your Imaging/Preboot Services server, locate the linux.2 file in \public\zenworks\imaging\tftp. Make a backup copy of this file.
2. On the Linux workstation, create a working directory for linux.2.
3. Using a transfer method such as FTP, transfer linux.2 to the directory created in Step 2.
4. Enter the following to rename linux.2 to linux.gz:

   ```
   mv linux.2 linux.gz
   ```

5. Enter the following to extract linux.gz:

   ```
   gzip -d linux.gz
   ```

   This will replace the linux.gz file with a file named linux. This file is a MINIX file system that can be mounted and changed.
6. Enter the following to create a mount point:

   ```
   mkdir /mnt/loop
   ```

7. Enter the following to mount the file system:

   ```
   mount -o loop linux /mnt/loop
   ```

8. Copy the driver files to the appropriate directory in the /mnt/loop directory structure.
9. Enter the following to unmount the updated file system:

   ```
   umount /mnt/loop
   ```

10. Enter the following to zip the file:

    ```
    gzip --v9c linux
    ```

11. Enter the following to rename the file:

    ```
    mv linux.gz linux.2
    ```

12. Using a transfer method such as FTP, transfer linux.2 to the TFTP server.

Another method of modifying Linux drivers for use with Preboot Services is to use a build script. This allows knowledgeable Linux users to maintain a build area where modifications can be made and new Preboot Services files can be created with a single script. These build scripts are released "as is" and are not supported by Novell or Novell Technical Support. They can be found at the

ZENworks Cool Solutions Web Community (http://www.novell.com/coolsolutions/zenworks/features/a_linux_scripts_zw.html) and include their own documentation.

Booting with a Non-English Keyboard

If you will image computers that have non-English keyboards, the imaging boot device or method must include additional language support, in the form of a language diskette. (When booting a computer from the imaging device or method, you will be prompted for this diskette.) For information on preparing this diskette, see the online help in the "Imaging Boot Disk Creator (Zimgboot.exe)" on page 483.

If the Language/Country drop-down list in the Imaging Boot Disk Creator utility doesn't have the keyboard language you need, you can close the utility and reconfigure it to support the additional language. This assumes you can find Linux keyboard support files somewhere on the Web.

Adding Support for Another Keyboard Language

1. Get the Linux .gz files that contain the keyboard mappings, fonts, and Unicode* mappings for the language that you want to add.
2. From the folder containing the zimgboot.exe file, browse to the bootdisk folder > copy the .gz files for the new language to the following subfolders:
   - The keyboard map file goes in the keymaps folder.
   - The font file goes in the consolefonts folder.
   - The Unicode map file goes in the consoletranS folder.
3. Add a section to the zimglang.ini file using the format illustrated for German in "Imaging Bootup Languages (Zimglang.ini)" on page 488.
   - **3a** For the bracketed section heading, specify the language or country name that you want shown in the Imaging Boot Disk Creator utility.
   - **3b** In the KEYMAP, FONT, and ACM parameters, specify the names and locations (relative to the bootdisk folder) of the keyboard map, font, and Unicode map files, respectively.
4. Save your changes to the zimglang.ini file.
5. Restart the Imaging Boot Disk Creator utility and verify that the new language appears in the Language/Country drop-down list.

Preparing a Workstation for Imaging

This section contains the following information:

- "Workstation Requirements" on page 451
- "Enabling a Workstation for Auto-Imaging Operations" on page 452

Workstation Requirements

This section gives the requirements for using a network-connected Windows workstation.

It is possible (but usually not as convenient) to image a workstation without connecting to the network. It is also possible to image non-Windows computers, but such operations can't be fully automated through NDS® or Novell eDirectory™ and the images can only be raw, bit-by-bit images of the entire hard disk, as opposed to customizable, file-by-file images of the data.

The following are the requirements for this workstation:

Workstation Must Have	Because
A supported Ethernet card	The workstation must connect with the imaging server to store or retrieve the images. This connection is made when the workstation is under the control of the ZfD Workstation Imaging engine (which is a Linux application), not when the workstation is running under Windows. Therefore, make sure the workstation has a supported Ethernet card. For more information, see Chapter 48, "Supported Ethernet Cards," on page 505.
Windows 98, NT 4, 2000, or XP installed	Unattended operations are currently supported only on 32-bit Windows platforms.
50 MB free disk space	Unless you are using Preboot Services, unattended operations require a ZfD Workstation Imaging (Linux) partition to be installed on the workstation hard disk, so that the imaging engine can gain control on bootup. The default partition size is 100 MB, and the minimum partition size is 50 MB. It is permissible for the 50 MB free space to be inside an existing partition. This partition is not required if you are performing manual imaging operations.
Standard hardware architecture	NEC* PC98 architecture is not supported.
PXE enabled	If you are using ZfD Preboot Services, PXE must be enabled either in the BIOS or through a PXE boot disk. See "Preboot Services (PXE)" on page 445 for more information.

Enabling a Workstation for Auto-Imaging Operations

The following procedure explains how to register the workstation as an object in your NDS or eDirectory tree, install a ZfD Imaging Agent on the workstation, and install a permanent ZfD Workstation Imaging (Linux) partition on the hard disk.

This procedure needs to be performed only once prior to performing auto-imaging (unattended) operations. It is not a prerequisite to performing manual imaging operations.

Complete this procedure if you are not using Preboot Services (PXE). If you have enabled PXE on the workstation and have installed ZfD 4 Preboot Services on your imaging server, this procedure is not a prerequisite to performing unattended imaging operations. For more information, see "Preboot Services (PXE)" on page 445.

1. If you haven't already done so, install the Novell Client™ on the workstation. For more information, see Overall Software Requirements in *ZENworks for Desktops 3.2 Getting Started Guide* of the ZfD 3.2 documentation.

   ZfD 4 lets ZENworks work with or without an installation of the Novell Client on the workstation. If your setup does not require the Client, then the ZfD Management Agent must be installed. For more information, see Installing the ZfD Management Agent on a Workstation in the *ZENworks for Desktops 4.0.1 Installation Guide* guide.

2. If you haven't already done so, register the workstation as an object in your NDS or eDirectory tree that contains the ZfD Workstation Imaging server.

   When you boot a Windows workstation from an imaging device or method and allow the bootup process to proceed in auto-imaging mode, the imaging engine runs on the workstation and contacts a ZfD Workstation Imaging server. In order for the workstation to be imaged, you must first either define an NDS or eDirectory policy for the ZfD Workstation Imaging server (for more information, see "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 457), or you must register the workstation as an object.

For more information on registering the workstation as an object, see "Automatic Workstation Import and Removal" on page 59.

You don't need to complete all the tasks mentioned in the instructions. Just create a server policy package that contains a minimal workstation import policy (use the defaults for naming, groups, and limits), and then associate the server package with the container where you want the Workstation object to be created. Then, configure the workstation to communicate with the import service on the imaging server, and reboot the workstation. Before proceeding with the next step, check your NDS or eDirectory tree to make sure the Workstation object was created.

3 Set a flag in the Workstation object that triggers the imaging operation you want.

For more information, see "Triggering an Unattended Imaging Operation" on page 461.

4 Install the ZfD Imaging Agent on the workstation.

When you put a new base image on a Windows workstation, the workstation receives the same identification data as the computer from which the image was taken, including such settings as the IP address and computer (NETBIOS) name. To work around this, you can install the ZfD Imaging Agent on the target workstation before reimaging it. This saves the workstation's current identity settings to an area on the hard disk that's safe from reimaging. When the workstation reboots after being reimaged, the agent restores the original settings.

IMPORTANT: The Imaging Agent does not save or restore any Windows NT/2000/XP Domain information. If you change a workstation's domain and then restore an image, the workstation will receive whatever domain is embedded in the new image.

The ZfD Imaging Agent has already been installed on the workstation if in Step 1 you did a custom Novell Client installation and chose the Imaging Services option. If this is the case, skip to Step 5. Or, you can choose to install the Imaging Agent by running the ZISD-9x or ZISD-NT application object on the workstation (for more information, see Chapter 21, "Distributing Applications to Users and Workstations," on page 207). Otherwise, proceed with Step 4a to install the ZfD Imaging Agent.

4a Browse to the zenworks\imaging folder in your ZfD installation (on the imaging server).

4b Complete the steps that correspond to the type of workstation:

Workstation Type	Steps
Windows 98	1. Copy ziswin.exe, zislib16.dll, and zislib32.dll to the novell\zenis folder. 2. Run ziswin.exe from the novell\zenis folder. 3. Run regedit.exe and browse to HKEY_LOCAL_MACHINE > Software > Microsoft > Windows > CurrentVersion > RunServices. 4. Add the string value `ZENwork Imaging Service` and set it to the filename and path of the ziswin.exe file. For example, c:\novell\zenis\ziswin.exe 5. Save the changes and close regedit.
Windows NT 4 or 2000	1. Copy ziswin.exe and ziswinr.dll (in the nls\english subfolder or the appropriate language subfolder) to your winnt\system32 folder. 2. From a command prompt, change to your winnt\system32 folder > type **`ziswin -install`** > press Enter.

Workstation Type	Steps
Windows XP	1. Copy ziswin.exe and ziswinr.dll (in the nls\english subfolder or the appropriate language subfolder) to your windows\system32 folder. 2. From a command prompt, change to your windows\system32 folder > type **`ziswin -install`** > press Enter.

4c Reboot the workstation.

5 Take an image of the workstation as instructed in "Manually Taking an Image of a Workstation" on page 462.

IMPORTANT: Do this even if you have taken an image of the workstation previously. This ensures that the new image captures the changes you made in the preceding steps.

6 When the image has been created, reboot the workstation with the first imaging boot diskette (or other imaging boot device) > type **`install`** at the boot prompt > press Enter.

This starts the process of creating the ZfD imaging partition in the first partition slot. It also destroys all existing partitions, even if slot 1 is empty and available. By default, the ZfD imaging partition size will be 100 MB.

If the ZfD imaging partition already exists, it will be upgraded, and your existing Windows partitions will be left intact. For information on updating Linux device drivers in your hard-disk partition, see "Adding Linux Drivers to Your Boot Device or Method" on page 449.

7 If prompted, reinsert the first imaging boot diskette > press Enter.

8 (Optional) When the ZfD imaging partition has been created and the bash prompt reappears, type **`img dump`** > press Enter.

This displays a list of the partition slots on the workstation. Unless you were upgrading your ZfD imaging partition, each partition slot should be empty and none should be active. The ZfD imaging partition is hidden from the list, so the number of partition slots in the list should be one less than before.

or

Type **`img`** to display a menu > select Dump > No Geometry.

9 At the bash prompt, restore the image you took in Step 5. Use the img restorep command or select Restore an Image > Proxy Image from the menu as instructed in Step 7 of "Manually Putting an Image on a Workstation" on page 463.

10 (Optional) When the image has been restored and the bash prompt reappears, use the img dump command to redisplay the list of the partition slots on the workstation.

or

Type **`img`** to display a menu > select Dump > No Geometry.

You should now see information about the Windows partitions that were restored and activated. There should still be one less partition slot than before because the ZfD imaging partition is still hidden (and will continue to be).

11 At the bash prompt, type **`lilo.s`** > press Enter.

12 When the bash prompt reappears, remove the diskette and reboot the workstation.

The workstation should boot to Windows. If the bash prompt reappears, enter the **`lilo.s`** command again and reboot a second time.

From this point on, whenever the workstation is rebooted, the imaging engine will gain control and check the imaging server to see if an imaging operation should be performed. If you have not configured the Workstation object (in NDS or eDirectory) to trigger an unattended imaging operation, the imaging engine will simply exit and automatically reboot the workstation to Windows.

Imaging a Server

In addition to imaging workstations, it is also possible to image servers. However, you should use caution. If you restore an old image of a server with NDS, eDirectory, or Active Directory replicas into a tree that has been active since the image was made, all the objects in the server's replicas might be very old. It might take a great deal of time before the directory is able to update the replicas. You might also experience difficulty mapping a drive to this server.

If you are considering taking images of servers as an alternative to backing up the servers, the recommendation is to use backup software rather than Workstation Imaging.

42 Setting Up Imaging Policies

The following sections explain how to set up policies for Novell® ZENworks® for Desktops (ZfD) imaging services, and how to select general imaging server settings. The procedures that are applicable to you depend on your imaging deployment strategy. (See Chapter 39, "Common Imaging Deployment Strategies," on page 439.)

- "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 457
- "Defining an Imaging Policy for Registered Workstations (Workstation Policy)" on page 459
- "Allowing Overwriting Filenames and Restricting Save Location of Image Files (Imaging Server Settings)" on page 460

Defining an Imaging Policy for Unregistered Workstations (Server Policy)

If a Windows workstation hasn't been registered as a Workstation object in NDS® or Novell eDirectory™ and you boot that workstation from an imaging device or method in auto-imaging mode, the imaging server is contacted and checks its Imaging Server Policy in NDS or eDirectory to determine which image to put down on the workstation.

If the base image specified by the policy is the same as the base image currently on the workstation (as reported by the imaging engine), the imaging server doesn't send any new images to put down on the workstation, unless the policy specifies to force down the base image again. If the policy specifies to force down the base image, or if the base image currently on the workstation is different than the base image specified by the policy, the imaging server sends down the new base image and any add-on images specified by the policy, and the imaging engine puts these images down on the workstation.

WARNING: If you configure an Imaging Server Policy to send an add-on image only (no base image) to a workstation, the workstation receives the add-on image, but it will also reboot and bring down the image again, resulting in a reboot/imaging loop.

In addition, if the imaging engine reports to the imaging server that data is missing from the workstation's image-safe area, the imaging server obtains the missing data from the Imaging Server Policy and sends it to the imaging engine, which then saves the data to the image-safe area.

To define the Imaging Server Policy for one or more imaging servers:

1. Prepare the various workstation images that the policy can prescribe. For details, see Chapter 45, "Preparing Images," on page 469.
2. If a Server Package hasn't already been created to hold the policies for the target imaging servers, create one as instructed in Chapter 9, "Creating Policy Packages and Setting Up Policies," on page 83.
3. Right-click the Server Package > click Properties.
4. Enable the Imaging Server policy > click Properties.

5 Follow this step if you are using Preboot Services:

If you are using Preboot Services but previously booted workstations from a ZfD Workstation Imaging (Linux) partition, you can select to disable the ZfD imaging partition on the General Imaging Partition property page. The partition is not removed with this option.

Use the General PXE Settings property page to specify the availability of the PXE menu, which displays when you boot a PXE-enabled workstation. Click Help for details.

If you want to specify a different image when using Preboot Services, rather than the default image that is defined, specify the image file and pathname.

6 On the Image Selection Rules page, click Add > select a Workstation Image object (for more information, see "Creating a Workstation Image Object" on page 471) > use the drop-down fields and operators to specify the conditions under which the selected image should be used (click Help for details) > click OK.

Repeat this step as many times as needed to specify the particular images that should be used under different conditions.

These rules will be used by your imaging server to determine which image to put on workstations during unattended imaging operations. The various hardware configuration data specified in the rules are compared against the actual hardware configuration data detected by the Workstation Imaging engine on the workstation. To see this data for a particular workstation, boot it with the imaging boot diskettes in manual mode and issue the **`img info`** command or enter **`img`** > select Information from the menu.

Take care to choose rules that apply only to the unregistered workstations you want imaged. Otherwise, an image could be unintentionally pushed to another workstation.

7 Repeat the previous step as needed to provide rules that will cover all the workstations serviced by the target imaging servers.

8 (Optional) If you want the imaging server to force down the base image determined by this policy even if it's the same as the base image currently on the workstation, select the check box on the bottom of the page.

WARNING: Use this option with care, because putting down a base image destroys all data that was added to the workstation since the last base image was put down. In most scenarios, you'll want to use this option only temporarily while a specific workstation is being imaged and not generally for all workstations, unless this policy is designed for a lab environment where you want the workstations to be reimaged every time they reboot. If you select this option as a temporary measure, be sure to deselect it after the specific imaging task is done.

9 On the Image-safe Data tab, fill in the IP Configuration, Windows Networking, and DNS Settings pages.

These pages supply image-safe data values that might be missing on the workstations that are serviced by the target imaging servers. For details on these pages, click Help.

10 Click OK to save the policy.

11 On the Associations page, add the containers and/or server objects that represent the target set of imaging servers.

12 Click OK to save the association.

Remember that the policy won't actually be consulted by the associated imaging servers unless the client requesting the imaging operation is an unregistered workstation that has been booted in auto-imaging mode.

Defining an Imaging Policy for Registered Workstations (Workstation Policy)

If a Windows workstation has been registered as a Workstation object in NDS or eDirectory and you boot that workstation from an imaging device or method in auto-imaging mode, the imaging server is contacted and checks the Workstation object to see if the administrator has flagged it to receive an image. If this is the case and the administrator hasn't specified which image to use, the imaging server consults the Workstation Imaging Policy associated with the Workstation object to determine which image to send down.

To define the Workstation Imaging Policy for one or more workstations:

1. Prepare the various workstation images that the policy can prescribe. For details, see Chapter 45, "Preparing Images," on page 469.
2. If a Workstation Package hasn't already been created to hold the policies for the target workstations, create one as instructed in Chapter 9, "Creating Policy Packages and Setting Up Policies," on page 83.
3. Right-click the Workstation Package > click Properties.
4. Enable the Workstation Imaging policy > click Properties.
5. Follow this step if you are using Preboot Services:

   If you are using Preboot Services but previously booted workstations from a ZfD Workstation Imaging (Linux) partition, you can select to disable the ZfD imaging partition on the General Imaging Partition property page. The partition is not removed with this option.

   Use the General PXE Settings property page to specify the availability of the PXE menu, which displays when you boot a PXE-enabled workstation. Click Help for details.

   If you want to specify a different image when using Preboot Services, rather than the default image that is defined, specify the image file and pathname.
6. On the Image Selection Rules property page, click Add > select a Workstation Image object (for more information, see "Creating a Workstation Image Object" on page 471) > use the drop-down fields and operators to specify the conditions under which the selected image should be used (click Help for details) > click OK.

   Repeat this step as many times as needed to specify the particular images that should be used under different conditions.

   These rules will be used by your imaging server to determine which image to put on workstations during unattended imaging operations. The various hardware configuration data specified in the rules are compared against the actual hardware configuration data detected by the Workstation Imaging engine on the workstation. To see this data for a particular workstation, boot it with the imaging boot diskettes in manual mode and issue the **`img info`** command or enter **`img`** > select Information from the menu.

   Take care to choose rules that apply only to the workstations you want imaged. Otherwise, an image could be pushed to another workstation unintentionally.
7. Click OK to save the policy.
8. On the Associations page, add the container, Workstation Group, or Workstation objects that represent the target set of workstations.
9. Click OK to save the association.

Remember that the policy won't actually be consulted by the imaging server unless you (or another administrator) flags a Workstation object to receive an image on the next boot.

Allowing Overwriting Filenames and Restricting Save Location of Image Files (Imaging Server Settings)

Most of the rules that comprise an Imaging Server Policy apply only when the imaging server is servicing a request to auto-image a workstation. Such rules aren't in force when the imaging server is servicing a manual (command line or menu) imaging request.

However, the following two aspects of the Imaging Server Policy are actually imaging server settings that always apply, including when the imaging server is servicing an automatic imaging request, when the imaging server is servicing a manual imaging request, when a registered workstations are booting up, and when unregistered workstations are booting up:

- Whether to allow the creation of new image files that overwrite existing image files on the server
- Whether to restrict the creation of new image files on the server to specific areas

To define these general behaviors for one or more imaging servers:

1. If a Server Package hasn't already been created to hold the policies for the target imaging servers, create one as instructed in Chapter 9, "Creating Policy Packages and Setting Up Policies," on page 83.
2. Right-click the Server Package > click Properties.
3. Enable the Imaging Server Policy > click Properties.
4. Fill in the items on the Security tab. Click Help for details.
5. Click OK to save the policy.
6. On the Associations page, add the containers and/or server objects that represent the target set of imaging servers.
7. Click OK to save the association.

43 Performing Basic Imaging Operations

The following sections provide instructions for these basic imaging operations:

- "Triggering an Unattended Imaging Operation" on page 461
- "Manually Taking an Image of a Workstation" on page 462
- "Manually Putting an Image on a Workstation" on page 463

These instructions assume that you have already prepared the imaging server (see Chapter 40, "Preparing an Imaging Server," on page 443), prepared workstations for imaging (see Chapter 41, "Setting Up Workstations for Imaging," on page 445), and set up imaging policies (Chapter 42, "Setting Up Imaging Policies," on page 457).

Triggering an Unattended Imaging Operation

The following procedure explains how to set a flag in the Workstation object that says to take or put an image on the workstation the next time it is booted, and then verify that the imaging operation occurs as expected.

1. If the imaging operation that you want to trigger is to put an image on the workstation, do the following. Otherwise, skip this step.

   1a. If you haven't already done so, create the image to be put on the workstation. Make sure to store it on your imaging server. For more information, see "Manually Taking an Image of a Workstation" on page 462.

   1b. In ConsoleOne®, create a Workstation Image object in your NDS® or Novell® eDirectory™ tree. Configure the object to point to the image file that is to be put on the workstation. For more information, see "Creating a Workstation Image Object" on page 471. For details on pointing to the image file, click Help in the Image File Location dialog box.

2. In ConsoleOne, right-click the Workstation object > click Properties.
3. On the ZENworks Imaging Configuration page, do either of the following:
   - To take an image of the workstation the next time it boots, check the first check box > click the browse button next to the available field > select your imaging server and the path and filename under which to store the new image > check the Use Compression check box and select a compression option if you want to use compression (click Help for details) > click OK.
   - To put an image on the workstation the next time it boots, check the Put an Image on This Workstation on Next Boot check box > check the box that says to use an image other than the effective policy image or multicast session > click the browse button next to the available field > select the Workstation Image object you created in Step 1b > click OK.

   IMPORTANT: Be sure that the imaging server storing the image or the workstation receiving the image has enough disk space for the image. Otherwise, you will receive a "Failed to write to proxy" error.

4 Click OK to save the imaging configuration settings.

After the imaging operation has been performed on the workstation, ZfD will clear these imaging configuration settings automatically so that the imaging operation won't keep recurring.

5 Verify that the imaging operation occurs as expected when you reboot the workstation.

Manually Taking an Image of a Workstation

The following procedure explains how to take an image of the workstation by booting from an imaging device or method and entering a particular imaging command. The image will be stored on your imaging server. (If you want to store an image locally rather than on an imaging server, see "Using a CD" on page 465 and "Using a Hard Disk or Jaz Drive" on page 466 in Chapter 44, "Setting Up Disconnected Imaging Operations," on page 465.)

Be sure that your imaging server has enough disk space for the image. Otherwise, you will receive a "Failed to write to proxy" error.

1 Boot the workstation using imaging boot diskettes, an imaging boot CD, or if it is PXE-enabled, boot it from the Imaging/Preboot Services server.

2 Enter **`manual`** at the boot prompt or select Start ZENworks Imaging in Maintenance Mode from the PXE menu.

3 (Optional) At the bash prompt, type **`img dump`** > press Enter.

or

Type **`img`** to display a menu > select Dump > No Geometry.

This displays a list of the partition slots on the workstation. For your reference, note the number and type of partitions and which one is active.

4 To take an image of the workstation, you have two choices:

- You can enter a command at the bash prompt using the following format:

  `img makep` *`serverIPaddr_or_DNSname //uncpath/newimg`*`.zmg [comp=`*`comp level`*`]`

  The makep parameter stands for "make on proxy," or in other words, create an image and store it on the imaging (proxy) server. The IP address or DNS name should be that of your imaging server, and the UNC path specifies the location and filename where the new image is to be stored. *comp level* is the amount of compression used when creating the image. Specify any number from 0-9. 0 means no compression. 1 is the same as Optimize for Speed and is used by default if you do not specify this parameter. 6 is the same as Balanced. 9 is the same as Optimize for Space. (Optimize for Speed takes the least amount of time but creates the largest image file. Optimize for Space creates the smallest image file but might take a significant amount of time. Balanced is a compromise between compression time and image file size.)

  For example:

  ```
  img makep 137.65.95.127 //xyz_srv/sys/imgs/cpqnt.zmg comp=6
  ```

  IMPORTANT: Make sure to use *forward slashes* in the UNC path as shown above. Backslashes aren't recognized by Linux. Alternatively, you can use backslashes and enclose the entire UNC path in quotes. The path you specify must exist on your imaging server.

- You can type **img** to display a menu > select an Image > Proxy Image. Type the IP address or DNS name of your imaging (proxy) server. Type the UNC path and filename where the new image is to be stored on the imaging (proxy) server. Select a compression option. (Optimize for Speed takes the least amount of time but creates the largest image file. Optimize for Space creates the smallest image file but might take a significant amount of time. Balanced is a compromise between compression time and image file size.) Specify any advanced parameters, such as x*partition*. If you want, specify additional information in the Description (a description of the image), Machine Name (the computer on which the image is being stored), Author (the name of the person entering this information), and Comments (any additional comments) fields.

For details on this and other related img command parameters, see "Imaging Engine (Img: Command Line and Menu)" on page 488.

Depending on the amount of data on the hard disk, the image might take several minutes to create. If the screen goes blank, just press any key. (Linux enters a screen-saving mode after a few minutes.)

5. When the image has been created and the bash prompt reappears, remove any diskettes from the drive and reboot the workstation.
6. (Optional) Verify that the image file was created on your imaging server. You might also want to check its size.

Manually Putting an Image on a Workstation

The following procedure explains how to put an image on the workstation by booting from an imaging device or method and entering a particular imaging command. The image will be retrieved from your imaging server.

Be sure that the workstation receiving a new image has enough disk space for the image. Otherwise, you will receive a "Failed to write to proxy" error.

1. If you haven't already done so, create the image that you will put on the workstation, as instructed in "Manually Taking an Image of a Workstation" on page 462.

   Make sure the image is of the same type of workstation (same hardware configuration) and is stored on your imaging server. You can use a previous image of the same workstation.

   IMPORTANT: If you are putting an image on a workstation without a ZfD Workstation Imaging (Linux) partition, make sure the image was made on a workstation without a ZfD imaging partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the workstation will fail to boot.

2. (Optional) Boot the workstation from a Windows startup disk and run fdisk to remove all partitions from the hard disk.

   TIP: Running FDISK is not required, but it is recommended for purposes of comparing the workstation's partitions before and after the imaging operation.

3. Boot the workstation using imaging boot diskettes, an imaging boot CD, or if it is PXE-enabled, boot it from the Imaging/Preboot Services server.
4. Enter **manual** at the boot prompt or select Start ZENworks Imaging in Maintenance Mode from the PXE menu.
5. If you are prompted for a language diskette, insert it > press Enter.
6. (Optional) At the bash prompt, type **img dump** > press Enter.

This displays a list of the partition slots on the workstation. For your reference, note the number and type of partitions and which one is active. If you removed all partitions using FDISK, each slot should be empty and none should be active.

or

Type **img** to display a menu > select Dump > No Geometry.

7 To put the new image on the workstation, you have two choices:

- You can enter a command at the bash prompt using the following format:

  ```
  img restorep serverIPaddr_or_DNSname //uncpath/newimg.zmg
  ```

  The restorep parameter stands for "restore from proxy," or in other words, retrieve an image from the imaging (proxy) server and put it on this workstation. The IP address or DNS name should be that of your imaging server, and the UNC path specifies the location and filename where the image is to be retrieved from. For example:

  ```
  img restorep 137.65.95.127 //xyz_srv/sys/imgs/cpqnt.zmg
  ```

  IMPORTANT: Make sure to use *forward slashes* in the UNC path as shown above. Backslashes aren't recognized by Linux. Alternatively, you can use backslashes and enclose the entire UNC path in quotes. The server portion of the path must be the name of your imaging server.

- You can type **img** to display a menu > select Restore an Image > Proxy Image. Type the IP address or DNS name of the imaging (proxy) server. Type the UNC path and filename where the image is to be retrieved from. Specify any advanced parameters, such as s*fileset* or a*partition*:p*partition*.

  For details on this and other related img command parameters, see "Imaging Engine (Img: Command Line and Menu)" on page 488.

Depending on the size of the image, it might take several minutes to put the image down. Images actually take slightly longer to put down than they do to take. If the screen goes blank, just press any key. (Linux enters a screen-saving mode after a few minutes.)

8 (Optional) When the image has been put down and the bash prompt reappears, type **img dump** > press Enter.

or

Type **img** to display a menu > select Dump > No Geometry.

As before, this displays a list of the partition slots on the workstation. You should now see information about the new partitions that were created and activated by the image that you just put down.

9 At the bash prompt, type **lilo.s** > press Enter.

10 Remove any diskettes from the drive and reboot the workstation. Verify that it boots to the operating system that was installed by the new image.

44 Setting Up Disconnected Imaging Operations

Disconnected imaging operations are inherently manual in the sense that they don't involve the network and thus can't be automated through NDS® or Novell® eDirectory™.

To perform a disconnected imaging operation on a computer, you must have a storage device to hold the image that will be created or put down, and that storage device must be locally accessible to the imaging engine (in Linux) when you boot the computer from the imaging device. The following sections explain how to set up and perform disconnected operations using different storage devices:

- "Using a CD" on page 465
- "Using a Hard Disk or Jaz Drive" on page 466

Using a CD

Because a CD is read-only, you can only use it as the storage medium for an image that will be put down, not for an image that will be created. The steps to put down an image from a CD depend on whether the CD is the imaging boot CD or some other (non-bootable) CD.

To put down an image from the imaging boot CD:

1. Use your CD-burning software to put the source image on the imaging boot CD. See "Preparing an Imaging Boot CD" on page 448 for details.
2. Boot the target computer from the CD and type **`manual`** at the boot prompt.

   If the computer fails to boot, see Can't Boot a Workstation from the Imaging Boot CD in Troubleshooting Workstation Imaging in the *ZENworks for Desktops 4 Troubleshooting Guide* guide.
3. At the Linux prompt, type **`img dump`** to view the available partitions. Note the partition number of the imaging boot CD.

   or

   Type **`img`** to display a menu > select Dump > No Geometry.
4. To put down the image, you have two choices:
   - You can use a command of the following format:

     `img restorel`*`pNumber /path/image`*`.zmg`

     where *pNumber* is the partition number of the imaging boot CD and *path* and *image* are the image path and filename from the root of the imaging boot CD.
   - You can type **`img`** to display a menu > select Restore an Image > Local Image. Select Local Linux File System (because the image resides on the imaging boot CD, which is the current local Linux file system). Type the image path and filename. Specify any advanced parameters, such as s*fileset* or a*partition*:p*partition*.

For details on these and other related img command parameters, see "Imaging Engine (Img: Command Line and Menu)" on page 488.

5 When the imaging is done, remove the CD and do the following to boot the computer with the new image:

5a At the Linux prompt, type **lilo.s** > press Enter.

5b Press Ctrl+Alt+Delete.

If the computer doesn't boot to the new operating system (that is, if the Linux prompt reappears), enter the **lilo.s** command again and reboot the computer a second time.

To put down an image from another (non-bootable) CD:

1 Use your CD-burning software to burn the source image onto a CD.

2 Boot the target computer from a ZfD Workstation Imaging device and type **manual** at the boot prompt. Insert the second, third, and fourth diskettes if you are prompted for them.

3 Insert the CD that contains the source image.

4 At the Linux prompt, enter **cdrom.s** to mount the CD.

This mounts the CD to /mnt/cdrom.

5 To put down the image, you have two choices:

- You can use a command of the following format:

  `img restorel /mnt/cdrom/path/image.zmg`

  where *path* and *image* are the path and filename of the image relative to the root of the CD.

- You can enter **img** to display a menu > select Restore an Image > Local Image. Select Local Linux File System (because the image resides on the imaging boot CD, which is the current local Linux file system). Type the image path and filename. Specify any advanced parameters, such as s*fileset* or a*partition*:p*partition*.

For details on other related command parameters, see "Imaging Engine (Img: Command Line and Menu)" on page 488.

6 When the imaging is done, remove the imaging device (if applicable) and do the following to boot the computer with the new image:

6a At the Linux prompt, type **lilo.s** > press Enter.

6b Press Ctrl+Alt+Delete.

If the computer doesn't boot to the new operating system (that is, if the Linux prompt reappears), enter the **lilo.s** command again and reboot the computer a second time.

Using a Hard Disk or Jaz Drive

When you boot a computer from a ZfD Workstation Imaging device, you can create an image on, or put down an image from, any primary FAT16 or FAT32 partition on an IDE or SCSI hard drive or Iomega* Jaz drive. You can also use the local ZfD Workstation Imaging (Linux) partition if one is installed. Any target partition must have sufficient space.

When you create an image, the partition where you will store the image is itself excluded from the image. When you put down an image, the source partition will not itself be altered.

To create an image on a hard disk or Jaz drive:

1. Boot the source computer from a ZfD Workstation Imaging boot device and enter **manual** at the boot prompt. Insert the second, third, and fourth diskettes if you are prompted for them.
2. At the Linux prompt, enter **img dump** to view the available partitions.

   or

   Enter **img** to display a menu > select Dump > No Geometry.

   Note the number of the FAT partition where you'll store the new image.
3. To create the new image, you have two choices:
   - You can use a command of the following format:

     `img makel[pNumber] /path/image.zmg [comp=comp_level]`

     where *pNumber* is the number of the partition to store the image in, and *comp_level* is the amount of compression used when creating the image. Specify any number from 0-9. 0 means no compression. 1 is the same as Optimize for Speed and is used by default if you do not specify this parameter. 6 is the same as Balanced. 9 is the same as Optimize for Space. (Optimize for Speed takes the least amount of time but creates the largest image file. Optimize for Space creates the smallest image file but might take a significant amount of time. Balanced is a compromise between compression time and image file size.) *Path* and *image* are the path and filename of the new image relative to the partition root. If you omit the partition number, the local ZfD imaging partition is used.
   - You can type **img** to display a menu > select Make an Image > Local Image. Select the partition to store the image in, or Local Linux File System to store the image in the local ZfD imaging partition. Type the image path and filename. Select a compression option. (Optimize for Speed takes the least amount of time but creates the largest image file. Optimize for Space creates the smallest image file but might take a significant amount of time. Balanced is a compromise between compression time and image file size.) Specify any advanced parameters, such as x*partition*. If you want, specify additional information in the Description (a description of the image), Machine Name (the computer on which the image is being stored), Author (the name of the person entering this information), and Comments (any additional comments) fields.

   For details on other related img command parameters, see "Imaging Engine (Img: Command Line and Menu)" on page 488.

To put down an image from a hard disk or Jaz drive:

1. Boot the target computer from a ZfD Workstation Imaging boot device and enter **manual** at the boot prompt. Insert the second, third, and fourth diskettes if you are prompted for them.
2. At the Linux prompt, enter **img dump** to view the available partitions.

   or

   Enter **img** to display a menu > select Dump > No Geometry.

   Note the number of the FAT partition where the source image is stored.
3. To put down the image, you have two choices:
   - You can use a command of the following format:

     `img restorel[pNumber] /path/image.zmg`

where *pNumber* is the number of the partition where the source image is stored, and *path* and *image* are the image path and filename relative to the partition root. If you omit the partition number, the local ZfD imaging partition is used.

- You can type **`img`** to display a menu > select Restore an Image > Local Image. Select Local Linux File System if the image is stored in the local ZfD imaging partition, or select the partition where the image is stored. Type the image path and filename. Specify any advanced parameters, such as s*fileset* or a*partition*:p*partition*.

For details on other related img command parameters, see "Imaging Engine (Img: Command Line and Menu)" on page 488.

4 When the imaging is done, remove the imaging device (if applicable) and do the following to boot the computer with the new image:

4a At the Linux prompt, type **`lilo.s`** > press Enter.

4b Press Ctrl+Alt+Delete.

If the computer doesn't boot to the new operating system (that is, if the Linux prompt reappears), enter the **`lilo.s`** command again and reboot the computer a second time.

45 Preparing Images

Novell® ZENworks® for Desktops (ZfD) provides tools for creating and compressing images of computer hard disks as well as images of specific add-on applications or file sets. ZfD also provides tools for customizing such images and for making images available to auto-imaging operations through NDS® or Novell eDirectory™. The following sections explain how to perform these tasks.

- "Creating a Workstation (Base) Image" on page 469
- "Creating an Add-On Image" on page 469
- "Customizing an Image" on page 470
- "Making an Image Available for Auto-Imaging" on page 471

Creating a Workstation (Base) Image

A *base* image is an image of all the partitions and data on a source computer's storage devices, such as hard disks and Jaz drives. Normally, such an image is prepared with the intent to completely replace the contents of a target computer's storage devices.

The overall process to create a base image is:

1. Boot the source computer from an imaging device or method.
2. Run the ZfD Workstation Imaging engine to take an image of the computer.

   You can do this manually or automatically. In manual mode, you interrupt the bootup process and issue an imaging command at the Linux prompt. For more information, see "Manually Taking an Image of a Workstation" on page 462. In automatic mode, you set a flag in the computer's Workstation object using ConsoleOne® and then let the bootup process proceed without interruption. For more information, see "Triggering an Unattended Imaging Operation" on page 461.

Creating an Add-On Image

An *add-on* image is an archived collection of files that will be applied to an existing Windows installation on a target computer. This is sometimes referred to as application overlay. The existing partitions and files on the target computer are left intact, except for any files that the add-on image might update.

An add-on image typically corresponds to an application or utility, or simply to a set of data files or configuration settings. There are two ways to create an add-on image, each resulting in a different kind of add-on image:

- Produce the add-on image from an Application object

You do this in ConsoleOne by using the Imaging property page (on the Common tab) of the Application object. For details, click Help on that property page.

An add-on image created in this manner is not fully installed on the target computer until after the computer reboots from being imaged and Application Launcher/Explorer starts up and runs the new Application object. Deploying the image is essentially another way to distribute an Application object.

- Drag files into a new image archive using Image Explorer

  You do this by starting Image Explorer, dragging files and folders from an existing Windows installation into the new image archive, and saving the archive to a file with a .zmg extension. For more information, see "Image Explorer (Imgexp.exe)" on page 479.

  Generally, an add-on image created in this manner doesn't require any post-processing on the target computer. It is simply a set of files that are copied to the appropriate locations on the hard disk, much like what happens when you unzip a WinZip archive. One exception is that the add-on image can contain Windows registry (.reg) files that will be applied to the registry automatically when the computer reboots after being imaged, if the Imaging Agent is installed on the computer. For more information, see "Customizing an Image" on page 470.

Customizing an Image

After you have created a base or add-on image as explained in the previous sections, you can customize it using the Image Explorer utility. Specifically, you can:

- Compress the image

  You can compress an image (including images created by previous versions of ZfD) by 40-60% of the original file size. There are three compression options. Optimize for Speed takes the least amount of time but creates the largest compressed image file. This option is used by default when an image is created. Optimize for Space creates the smallest image file but might take a significant amount of time. Balanced is a compromise between compression time and image file size.

  (You can also use the options on the ZENworks Imaging Configuration property page for the workstation object in ConsoleOne to specify compression options if you do not want the default, Optimize for Speed.)

- Purge deleted files

  Excluded or hidden files and folders can be completely removed from an open image. This saves space in the image if you no longer want to include the files.

- Exclude individual files and folders from the image

  In doing this, you create variants of the image by specifying which of ten possible *filesets* (variants) to exclude a given file or folder from. The variants exist merely as internal attributes of the same image archive.

  WARNING: Do not exclude .bpb files from a base image or the workstation won't be able to boot the new operating system after receiving the image.

- Add files and folders to the image

  By default, any file or folder you add is included in all variants. To change this, you must explicitly exclude the file or folder from one or more variants.

- Add Windows registry (.reg) files

The registry settings contained in the .reg files that you add are applied after the image is put down and the target computer reboots to Windows, if the Imaging Agent has been installed on the computer.

As with any other file or folder that you add, a .reg file is included in all variants of the image unless you explicitly exclude it from one or more variants.

For information on starting Image Explorer, see "Image Explorer (Imgexp.exe)" on page 479. For information on how to complete the above tasks after you have started the utility, see the online help in the utility.

Making an Image Available for Auto-Imaging

When you boot a computer from an imaging device or method and allow the bootup process to proceed in auto-imaging mode, the imaging operation that is performed on the computer is determined by policies and settings that you define in NDS or eDirectory.

In order to make an image available to such operations, you must expose it as a Workstation Image object in NDS or eDirectory. Otherwise, when you define imaging policies and settings in NDS or eDirectory, you won't have any way to refer to the image.

Creating a Workstation Image object also allows you to combine a base image and one or more add-on images into a single entity that can be put down on target computers. You can specify a standard image file to put down, or you can create a script to further customize your imaging operation. You can also specify that a particular variant of an image be used. The sections that follow give instructions for performing these tasks.

- "Creating a Workstation Image Object" on page 471
- "Associating an Add-On Image with a Base Image" on page 472
- "Using a Variant of an Image" on page 472

Creating a Workstation Image Object

1. Create the base image that the Workstation Image object will refer to. For more information, see "Creating a Workstation (Base) Image" on page 469.

   Although it isn't typical, you can create a Workstation Image object that refers only to one or more add-on images. However, if you want a base image to be put down in the same operation as the add-on images, you should include both types of images in the Workstation Image object.

2. Copy the image file to a ZfD Workstation Imaging server that is accessible as a server object in your NDS or eDirectory tree.
3. In ConsoleOne, open the NDS or eDirectory tree and browse to the container where you want to create the Workstation Image object.
4. Right-click the container > click New > Object > select Workstation Image from the list of object classes > click OK.
5. Enter a name for the new object.

   Example: `Dell NT4 Image`
6. Click Define Additional Properties > OK.
7. Click Use Standard Imaging.

or

Click Use Scripted Imaging > specify the script you want to use. See the online help for examples of how you can use scripts. Skip to Step 10.

8. Under Base Image File, click the browse button next to the field > select the imaging server where the image resides > select or specify the path and filename of the image > click OK.

   For details on selecting or specifying the path and filename, click Help in the Image File Location dialog box.

   If the Workstation Image object will consist only of add-on images, leave the Base Image File field blank, and skip to Step 5 of "Associating an Add-On Image with a Base Image" on page 472.

9. If you are using Preboot Services but formerly booted from ZfD Workstation Imaging (Linux) partitions on workstations, you can delete the ZfD imaging partition at the same time you put down an image. To do so, select the Delete the ZENworks Imaging Partition, If It Exists, When Bringing Down The Base Image check box. You can delete the ZfD imaging partition only when the workstation is booted from an imaging boot device or method other than the ZfD imaging partition.

10. Click OK to save the Workstation Imaging object.

Associating an Add-On Image with a Base Image

1. Create the add-on image that you will associate with the base image. For more information, see "Creating an Add-On Image" on page 469.

2. Copy the image file to a ZfD Workstation Imaging server that is accessible as a server object in your NDS or eDirectory tree.

   You might want to copy the add-on image to the same location as the base image.

3. In ConsoleOne, open the NDS or eDirectory tree and browse to the Workstation Image object that refers to the base image. If you haven't created this object yet, do so as instructed in "Creating a Workstation Image Object" on page 471.

4. Right-click the object > click Properties.

5. Under Add-on Image Files, click the Add button > select the imaging server where the add-on image resides > select or specify the path and filename of the image > click OK.

   For details on selecting or specifying the path and filename, click Help in the Image File Location dialog box.

   You can associate more than one add-on image with a base image. The add-on images will be put down after the base image in the order listed on this page.

6. Click OK to save the Workstation Imaging object.

Using a Variant of an Image

As explained in "Customizing an Image" on page 470, you can exclude individual files and folders from any of 10 possible *filesets* (variants) of an image. The variants exist merely as internal attributes of the same image archive.

Because creating an image of a workstation can take a fair amount of time, it is more efficient in some cases to just create an image of a few workstations and customize those images to get all the variants you need. Even though the variants do not all exist as separate, physical image files, you

can access them as though they were. How you do this depends on whether you are performing a manual or automated imaging operation, as explained below.

Type of imaging operation	How to specify the variant to use
Automatic (NDS or eDirectory-based)	In the Workstation Image object, specify the number of the variant in the Use File Set field. All NDS or eDirectory policies and settings that specify that Workstation Image object will use the specified variant. You can create multiple Workstation Image objects that point to the same base image but to different variants.
Manual (command-line or menu)	Use the `s` parameter on the `img restore` command. For example, to specify variant number 3: `img restorel dellnt4.zmg s3` or You can enter **`img`** at the bash prompt to display a menu > select Restore an Image > Local Image. Specify s*fileset* (for example, s3) in the Advanced Parameters field. For details, see “Imaging Engine (Img: Command Line and Menu)” on page 488.

46 Multicasting Images

Novell® ZENworks® for Desktops (ZfD) Imaging software includes an imaging multicast capability. The following sections explain what this is, why you might want to use it, and the overall procedure for using it.

- "Introduction to Multicasting" on page 475
- "Multicast Procedure" on page 476

Introduction to Multicasting

The following topics are covered in this section:

- "What Is Multicasting?" on page 475
- "Why Use Multicast?" on page 475

What Is Multicasting?

To *multicast* an image is to take an image of one computer (the *master*), immediately send it over the network to multiple other computers (the *participants*), and put it down simultaneously on those computers. You can specify a workstation as the session master, or you can specify an image file that you have previously saved and customized.

If the session master is a workstation, a base image is taken of all the partitions on the hard disks and other storage devices (such as Jaz drives) of that workstation.

Before the image is put down on the participating computers, all existing partitions are removed from the hard disks and writable storage devices of those computers.

NOTE: For multicasting to work properly, the routers and switches on the network must have multicast features configured. Otherwise, multicast packets might not be routed properly.

(Historical note: In versions of ZfD prior to ZfD 3.2, the master had to be a Linux workstation, which formerly restricted multicasting to exact "cloning" of the workstation.)

Why Use Multicast?

Multicasting is the way to use ZfD Workstation Imaging services for mass reimaging with the least amount of overhead. It is useful if you have one computer with a clean software configuration that you want to duplicate on several other machines, or if you have a single image that you want to set up on multiple machines.

With multicasting, all you need is a physical network with modern routers and switches. (If you will be setting up multicasting by visiting each computer, you will also need imaging boot diskettes, an imaging boot CD, or the computers must be PXE-enabled.) The computers that will

be imaged must be physically connected to the network. They can be computers with existing operating systems of any kind, or they can be new computers with no operating system installed.

Limitations

One significant limitation of using multicast without installing any ZfD software is that it results in a set of computers that have duplicate network identities—the IP addresses, Computer (NETBIOS) names, Workgroup memberships, and Security Identifiers (Windows NT/2000/XP only) are all the same and will cause conflicts if deployed on the network without change.

For a handful of computers, this might not be a problem. But for a larger number, if the computers have Windows, you should install the ZfD Imaging Agent on them before doing the multicast. (See Step 4 of "Enabling a Workstation for Auto-Imaging Operations" on page 452.) The Imaging Agent saves the computer's network identity settings before the multicast session and restores them afterwards.

Multicast Procedure

There are a couple of ways to conduct a multicast session. You can:

- Define an automatic session and the participating computers in ConsoleOne®
- Physically visit each computer yourself and start the multicast sessions one at a time. Starting with ZfD 4, you can start the manual session from the imaging server.

Defining an Automatic Session

1. (Optional) Install the ZfD Imaging Agent on each of the participating computers.

   See "Why Use Multicast?" on page 475 for the reasons and for further instructions.
2. In ConsoleOne, right-click the Server object > click Properties > the ZENworks Imaging tab.
3. Click Add > type a name for the multicast session > click OK.
4. On the Multicast Session Settings page, specify the Master Image Source.

   You can specify an image file or a master workstation.

   A workstation cannot be the master if it is being used as a master in another multicast session or if it explicitly participates in any other session.
5. Decide how many participating workstations you want to have booted up before the multicast session begins. Specify this number in the Clients Have Joined text box.

   The default if you do not specify a number is 5 workstations.
6. If not enough workstations have booted up to fulfill the Clients Have Joined requirement, the multicast session will begin if a participating workstation boots up and a certain amount of time passes without another participating workstation booting up. Specify this amount of time in the Minutes Have Elapsed Since a New Client Has Joined text box.

   The default if you do not specify a time is 15 minutes.
7. To delete the session after it has finished, select the last check box.
8. On the Multicast Session Participation page, click Add Workstation under Include the Following Workstations to explicitly add the workstation objects that you want to include in this multicast session.

   or

To create rules to select the workstations you want to participate in this multicast session, click Add Rule under Include Machines Which Meet Any of These Criteria.

Click Help on the Participation page for more information.

9 Click OK to return to the ZENworks Imaging Multicast Sessions page.

10 The check box next to the multicast session name is automatically selected, showing that the session is enabled. If you want to disable a multicast session, deselect the check box next to the session name.

11 If multiple multicast sessions are defined that use rules to select participating workstations, it is possible that a workstation could qualify to participate in more than one session. If this occurs, the first enabled session in this list for which the workstation qualifies takes precedence over the other enabled sessions. If you want to change the position of a session in the list, select the multicast session name > click Move Up or Move Down.

12 Click OK.

Physically Visiting Each Computer

1 (Optional) Install the ZfD Imaging Agent on each of the participating computers.

See "Why Use Multicast?" on page 475 for the reasons and for further instructions.

2 Create a set of imaging boot diskettes or an imaging boot CD for each person who will assist with the multicast session, or enable PXE on the participating computers.

If you don't know how to do this, see "Preparing an Imaging Boot Device or Method" on page 445.

3 At each computer, including the master computer (unless you will be starting the multicast session from the imaging server), access a Linux prompt by using the imaging boot diskettes, imaging boot CD, or if it is PXE-enabled, boot it up.

4 Enter **`manual`** at the boot prompt or select Start ZENworks Imaging in Maintenance Mode from the PXE menu.

5 To identify each participating computer in the multicast session, you have two choices:

- You can enter the following command at the bash prompt of every computer:

  `img session` ***`name`***

  where *name* is any string that uniquely identifies this multicast session from other multicast sessions that might be in progress on the network. Use the same session name on each of the participating computers in this multicast session. You can specify any multicast session, including one that originates from the proxy server (as long as you specify the session name used by the proxy server).

  Example: `img session doug`

  The `img session` command can take other parameters that allow you to designate the master computer and the imaging start time beforehand. See "Imaging Engine (Img: Command Line and Menu)" on page 488 for details.

- You can type **`img`** at the bash prompt to display a menu > select Multicast Session > select Client if this is a participating computer or Master if this is the session master. Fill in the Session Name, Number of Clients (applies only to the session master), and Timeout (applies only to the session master) fields. See "Imaging Engine (Img: Command Line and Menu)" on page 488 for details.

6 Start the multicast session from the master computer or from the imaging server. If you start the session from the master computer, the session master must be a workstation. If you start the session from the imaging server, the session master must be a previously saved image file.

To start the multicast session from the master computer, at the master computer, type **m** > press Enter. At the master computer, after all the other computers have registered as participants, type **g** > press Enter.

The imaging engine begins creating the image of the master computer and the image is sent to and put down on each participating computer. Any problems are reported back and displayed on the master computer.

or

To start the multicast session from the imaging server, load the imaging server (imgserv.nlm or .dll or .dlm) > select Manually Start Multicast > specify the full path to the image file you want to multicast > specify session parameters > select Yes to start the multicast session.

The image is sent to and put down on each participating computer.

At the imaging server, select Multicast Sessions to see how many clients have registered and how many the session is still waiting for. For example, 3/2 means 3 clients have registered and 2 more need to register before the session can begin. You can delete any session listed, even if it is in progress, by selecting the session name > pressing Delete.

7 At each participating computer, when the imaging is done, do the following to boot the computer with the new operating system:

7a At the Linux prompt, type **lilo.s** > press Enter.

7b Press Ctrl+Alt+Delete.

If the computer doesn't boot to the new operating system (that is, if the Linux prompt reappears), enter the **lilo.s** command again and reboot the computer a second time.

47 Imaging Utilities and Options

The following sections provide reference information on Novell® ZENworks® for Desktops (ZfD) Imaging utilities, commands, configuration settings, and log formats.

- "Image Explorer (Imgexp.exe)" on page 479
- "Imaging Agent (Ziswin.exe)" on page 480
- "Image-Safe Data Viewer and Editor (Zisview and Zisedit)" on page 481
- "Imaging Boot Disk Creator (Zimgboot.exe)" on page 483
- "Imaging Bootup Parameters (Settings.txt)" on page 486
- "Imaging Bootup Languages (Zimglang.ini)" on page 488
- "Imaging Engine (Img: Command Line and Menu)" on page 488
- "Imaging Server (Imgserv.nlm or .dll or .dlm)" on page 500
- "Imaging Server Log (Zimglog.xml)" on page 501

Image Explorer (Imgexp.exe)

Use the Image Explorer utility at a Windows workstation to view or customize workstation images or to create add-on images.

Imgexp.exe is located in the zenworks\imaging folder in your ZfD installation (on the imaging server).

Using the Image Explorer

To start the Image Explorer as a standalone utility (from Windows), double-click the imgexp.exe file. There are no command line parameters. To start the utility from ConsoleOne®, click Tools > ZENworks Utilities > Imaging > Image Explorer.

After starting the utility, you can create a new add-on image or open an existing workstation image. You can compress an image. You can browse and view the Windows partitions, folders, and files in the open image. You can customize the image by adding or excluding individual files and folders and by adding Windows registry (.reg) files that will be applied after the image is put down. You can associate these customizations with any of ten possible variants of the image. You can purge deleted and hidden files from an image. For information on how to perform these tasks, see the online help in the utility.

IMPORTANT: Do not exclude .bpb files from a base image or the workstation won't be able to boot the new operating system after receiving the image.

NOTE: Non-Windows partitions, such as NetWare® partitions, are visible when you open an image, but their contents are not.

Images larger than 4 GB stored on a NetWare server cannot be opened by Image Explorer.

Imaging Agent (Ziswin.exe)

The Imaging Agent is an extension to the Windows bootup procedure on a workstation. It runs before any network communications are established. It enables you to:

- Make an existing Windows workstation safe for reimaging

  When you install the Imaging Agent on an existing Windows workstation, it saves certain workstation-unique data (such as the IP address and Computer name) to an area on the hard disk that is safe from reimaging. After the workstation is reimaged and Windows reboots, the agent restores the data from the image-safe area so the workstation can communicate on the network using the same identity as before.

- Automatically assign a network identity to a brand new workstation

  A new workstation (with no Windows operating system) doesn't have a network identity established yet. You can define network identity information for such a workstation in an NDS or Novell® eDirectory™ policy and apply it when the workstation receives its first Windows image. In this scenario, the Windows image is put down (including the Imaging Agent) on the workstation and the identity information from the NDS or eDirectory policy is written to the image-safe area on the hard disk. When the workstation reboots, the Imaging Agent reads the data from the image-safe area and applies it to the Windows installation, thus establishing the workstation's network identity automatically.

Before you install the Imaging Agent on a workstation, the files that comprise it are available in the zenworks\imaging folder in your ZfD installation (on the imaging server). After you install the Imaging Agent on a workstation, it is located either in the Windows system folder or in novell\zenis on the drive where Windows is installed.

Installing the Imaging Agent

To install the Imaging Agent so that it runs automatically each time Windows starts, follow the instructions in Chapter 41, "Setting Up Workstations for Imaging," on page 445.

The data that the Imaging Agent saves to (or restores from) the image-safe area includes the following:

- Whether a static IP address or DHCP is used
- If a static IP address is used:
  - IP address
  - Subnet mask
  - Default gateway (router)
- Computer (NETBIOS) name
- Workgroup that the workstation belongs to, if any
- If the workstation has been registered in NDS or eDirectory:
  - Distinguished name of the Workstation object
  - Context of the Workstation object
  - NDS or eDirectory tree that the Workstation object belongs to

On a workstation that has just received a new Windows NT/2000/XP base image, in addition to restoring the above data, the agent also locates and modifies all instances of the Security Identifier

(SID). This ensures that the workstation has a SID that is unique from other workstations that might receive the same image.

IMPORTANT: The Imaging Agent does not save or restore any Windows NT/2000/XP Domain information. If you change a workstation's domain and then restore an image, the workstation will receive whatever domain is embedded in the new image.

Image-Safe Data Viewer and Editor (Zisview and Zisedit)

After booting a workstation from an imaging device, you can enter **`zisedit`** and **`zisview`** at the Linux bash prompt to edit and view the image-safe data for that workstation.

Image-Safe Data Viewer

The image-safe data viewer (zisview) displays the following information about the workstation:

Category	Information
Image-safe Data	◆ Version The version number of the Imaging Agent (ziswin) ◆ Just imaged If this is set to False, the Imaging Agent (ziswin) will read data from the Windows registry and write it to the image-safe data store. If this is set to True, the Imaging Agent will read data from the image-safe data store and write it to the Windows registry. ◆ Last image a script Shows whether or not the last image was restored using a script ◆ Last image restored The name of the last base image that was restored to the workstation
Workstation Identity Information	◆ Workstation Object The distinguished name of this computer's workstation ◆ Preferred Tree The NDS or Novell eDirectory tree containing the workstation object ◆ NetBIOS Name The NetBIOS name for the workstation ◆ Workgroup The Microsoft network workgroup of the workstation ◆ Windows SID The Windows Security ID of the workstation ◆ Workstation ID The workstation identification number

Category	Information
Production IP Information	• Uses DHCP or Static IP Address If an IP address is being used, this shows the IP address, gateway, and subnet mask.
Production DNS Information	• DNS Servers The number of DNS nameservers used for DNS name resolution • DNS Suffix The DNS context of the workstation • DNS Hostname The DNS local hostname of the workstation

To use zisview, enter any of the following commands at the Linux bash prompt:

Command	Explanation
`zisview`	Displays all image-safe data
`zisview -z field`	Displays information about a specific field or fields. *field* is one or more field names separated by a space. *field* is not case-sensitive. All of the following are valid field names: JustImaged ScriptedImage LastBaseImage ObjectDN Tree NetBIOSName WorkGroup SID WorkstationID DHCP IP Gateway Mask DNSServerCount DNSSuffix DNSHostName
`zisview -s`	Creates a script that can be used to generate environment variables that contain all the image-safe data fields
`zisview -h`	Displays help for zisview

Image-Safe Data Editor

Use the image-safe data editor (zisedit) to change, clear, or remove information from the workstation's image-safe data.

To use zisedit, enter any of the following commands at the Linux bash prompt:

Command	Explanation
`zisedit`	This displays a screen showing all of the image-safe data fields. You can add or change any of the information in the fields.
`zisedit field=new_information`	You can change the information for one field using this syntax, where *field* is any valid field name and *new_information* is the information you want this field to contain. *field* is not case sensitive. For example, enter **`zisedit Mask=255.255.252.0`** to enter this information in the subnet mask field. All of the following are valid field names: JustImaged ScriptedImage LastBaseImage ObjectDN Tree NetBIOSName WorkGroup SID WorkstationID DHCP IP Gateway Mask DNSServerCount DNSSuffix DNSHostName
`zisedit -c`	Clears all image-safe data fields
`zisedit -r`	Removes all image-safe data fields
`zisedit -h`	Displays help for zisedit

Imaging Boot Disk Creator (Zimgboot.exe)

Use the Imaging Boot Disk Creator at a Windows workstation to create or update imaging boot diskettes, so you can boot computers to perform imaging tasks. Also use this utility to create a PXE boot disk to be used with a computer that cannot be PXE enabled, and to create a diskette which contains Linux utilities.

IMPORTANT: You can update imaging boot diskettes only in the sense that the same physical diskettes can be reused. When updating the second, third, and fourth diskettes or the optional language diskette, you must reformat the diskette before updating it. The first diskette can be reused without reformatting.

Zimgboot.exe is located in the zenworks\imaging folder in your ZfD installation (on the imaging server). It is also accessible from the Tools menu of ConsoleOne.

This section includes the following information:

- “Starting the Imaging Boot Disk Creator” on page 484

- "Using Zimgboot.exe to Add Linux Drivers" on page 484
- "Using Zimgboot.exe to Create a Language Disk" on page 485
- "Using Zimgboot.exe to Create a Utility Disk" on page 485
- "Using Zimgboot.exe to Create a PXE Disk" on page 486

Starting the Imaging Boot Disk Creator

To start the boot disk creator as a standalone utility (from Windows), double-click the zimgboot.exe file. There are no command line parameters. To start the utility from ConsoleOne, click Tools > ZENworks Utilities > Imaging > Create or Modify Boot Diskette.

TIP: If the Imaging Boot Disk Creator fills up too much of your screen, change your screen resolution to a setting greater than 800 X 600.

For the overall process to create imaging boot diskettes, see "Creating Imaging Boot Diskettes" on page 446. When creating the diskettes, you can configure various aspects of the imaging bootup process, including:

- How to communicate on the IP network, if necessary
- How automated the imaging bootup process should be
- Which imaging server to contact during automated operations
- How large the imaging ZfD Workstation Imaging (Linux) partition on the hard disk should be, if one will be created
- Which language support (English or otherwise) to load for the keyboard

For details on these and other configuration options, see the online help (click the Help menu or press F1) in the utility. The configuration settings you make in the utility are saved to the settings.txt file on the fourth imaging boot diskette. You can edit this file after creating the diskettes if needed. For details on the format of this file, see "Imaging Bootup Parameters (Settings.txt)" on page 486.

If you need to create imaging boot diskettes to boot with a non-English keyboard but the language you need isn't listed in the utility, see "Imaging Bootup Languages (Zimglang.ini)" on page 488.

Using Zimgboot.exe to Add Linux Drivers

Use the Add Linux Drivers function to specify the Linux drivers you want to place on the fourth boot diskette (if space allows) or on an additional Linux drivers diskette.

Using this function, you can search for and add the network path to Linux driver files that you have created or downloaded. The dialog box helps you to build a drivers list and categorize it by driver type (SCSI, Block, Network, PCMCIA, and Miscellaneous). You can also remove unwanted drivers from the list. This master list of driver files can be added to a diskette that you can specify later.

The Add Linux Drivers function also lets you specify the drivers you want to load by default. You do this by selecting the name of a driver on the master list and then clicking the Load button. This moves the driver name to the default load list, where you can change the load order of the default drivers and further specify their individual loading parameters.

When your load list is ready, you can use a function in zimgboot.exe to copy the additional Linux drivers to a diskette. All of the driver files are stored in different subdirectories of the \drivers directory on the diskette:

- Network drivers are stored in \drivers\net
- PCMCIA drivers are stored in \drivers\pcmcia
- Block drivers are stored in \drivers\block
- SCSI drivers are stored in \drivers\scsi
- Miscellaneous drivers are stored in \drivers\misc

These drivers can also be added to an imaging boot CD, hard-disk partition, or for use with Preboot Services. For more information, see "Preparing an Imaging Boot CD" on page 448 and "Adding Linux Drivers to Your Boot Device or Method" on page 449.

Obtaining Linux Drivers

To obtain a Linux driver for your particular hardware, visit the Web site of the hardware vendor and check for a download location.

There are also some other Web sites where you can obtain drivers:

- Network drivers can be downloaded from the Scyld Computing Corporation (http://www.scyld.com). Click Network Drivers.
- PCMCIA drivers can be downloaded from the Linux PCMCIA Information Page (http://pcmcia-cs.sourceforge.net).

You can also get additional Linux drivers at the Novell ZENworks Cool Solutions Web Community (http://www.novell.com/coolsolutions/zenworks/features/a_linux_drivers_zw.html).

To learn more about drivers, including the loading parameters you need to specify, see the Linux Documentation Project (http://www.linuxdoc.org) and visit the following HOWTO (http://www.linuxdoc.org/HOWTO/HOWTO-INDEX/howtos.html) sites:

- Hardware
- PCMCIA
- SCSI
- Ethernet

Using Zimgboot.exe to Create a Language Disk

If you use the Boot Disk Creator to create boot diskettes, and if you choose a non-English keyboard in the Language/Country field of the Boot Disk Creator dialog box, you can click Create Language Disk to create a language diskette that will be used to boot the workstation with the imaging diskettes in the non-English language you chose. The diskette you use must be an empty, formatted, high-density diskette. Do not reuse an old imaging diskette unless you reformat it first.

Using Zimgboot.exe to Create a Utility Disk

You can use the Boot Disk Creator to create a diskette that contains Linux utilities such as df (shows disk usage), fdisk, less, more, host (performs DNS lookups in order to convert DNS names to IP addresses), ldd (shows shared library dependencies), pico (text editor), sed (stream file editor), and touch (changes file time stamps). These utilities are not needed to perform imaging, but they may be useful to you for debugging purposes when imaging is booted to manual or maintenance mode.

To create the utility disk, insert an empty, formatted, high-density diskette and click Create Utility Disk. When created, the utility disk will contain a tar file, utility.tgz. To decompress the file and extract it to the root file system, enter **`utility.s`** at the linux bash prompt.

Using Zimgboot.exe to Create a PXE Disk

You can use the Boot Disk Creator to create a PXE boot diskette that will allow you to use PXE on a workstation that is not PXE-enabled. Click Create PXE Disk to launch PXE-on-Disk. You will need one empty, formatted, high-density diskette.

If you are running ConsoleOne from a NetWare imaging server, the Create a PXE Disk button is disabled because the ZfD installation program does not copy PXE-on-Disk files to a NetWare server. You will need to copy the PXE-on-Disk files to a Windows workstation.

For more information, see the *ZENworks for Desktops 4 Preboot Services Installation and Configuration Guide* guide.

Imaging Bootup Parameters (Settings.txt)

The settings.txt file contains parameters that control how the imaging boot-up process occurs.

Settings.txt is installed to the root of the imaging boot device (CD, hard-disk partition, the fourth diskette, or on the Imaging/Preboot Services server).

Settings.txt Parameters

Settings.txt is a plain text file that contains various parameters, each on a separate line. Each parameter has the general format of `PARAMETER=value`. Lines that begin with a pound sign (#) are comments and are ignored during the imaging bootup process.

The format and function of each parameter in the settings.txt file are described in the table below.

Parameter	Specifies
PROMPT	Whether to prompt for each configuration setting when you boot a computer from the imaging device. If you leave this parameter commented out or set it to No, the computer boots using the configuration settings specified in settings.txt and you can't override the settings during bootup unless you type **`config`** at the boot prompt before the Linux operating system begins to load. If you set this parameter to Yes, you are automatically prompted for each configuration setting during bootup.
PARTITIONSIZE	The number of megabytes to allocate to the ZfD Workstation Imaging (Linux) partition if you choose to create one locally on a computer when you boot the computer from the imaging device. The default size is 100 MB. The minimum partition size is 50 MB. The maximum size allowed is 2048 MB (2 GB). If you plan to store an image in the ZfD imaging partition, such as to enable the computer to be restored to a certain state without connecting to the network, you might want to specify a larger size on this parameter. Example: `PARTITIONSIZE=500`
IPADDR	The IP address used by a computer to communicate on the network when you boot the computer from the imaging device, if a static IP address is needed. Example: `IPADDR=137.65.95.126` If you want DHCP to be used, leave this and the next two parameters commented out.

Parameter	Specifies
GATEWAY	The IP address of the gateway (router) to be used by the computer, if the computer is using a static IP address. Example: `GATEWAY=137.65.95.254` If DHCP is being used, leave this parameter commented out.
NETMASK	The subnet mask to be used by the computer, if the computer is using a static IP address. Example: `NETMASK=255.255.252.0` If DHCP is being used, leave this parameter commented out.
DNSDOMAINSUFFIX	The list of DNS domain suffixes to be used to identify connections used by this computer. Use a space to separate entries. Example: `DNSDOMAINSUFFIX=example.novell.com example.xyz.org` If DHCP is being used, leave this parameter commented out.
DNSNAMESERVER	The list of DNS name servers, by IP address, to use for resolving DNS domain names used on this computer. Use a space to separate entries. Example: `DNSNAMESERVER=123.45.6.7 123.45.6.9` If DHCP is being used, leave this parameter commented out.

PROXYADDR	The IP address or full DNS name of the imaging (proxy) server to connect to when you boot a computer from the imaging device in auto-imaging mode.
	
	Examples:
	`PROXYADDR=137.65.95.127`
	`PROXYADDR=imaging.xyz.com`
	
	This parameter is used to set the PROXYADDR environment variable in Linux when the computer is booted from the imaging device. The imaging engine then reads this variable to determine which server to contact if it's running in automatic mode. Whether it's running in automatic or manual mode, the imaging engine attempts to log the imaging results to the server specified in this variable.

MANUALREBOOT	Whether you must reboot a computer manually after it was booted from the imaging device in automatic mode. (If the computer was booted from the imaging device in manual mode, you must always reboot the computer manually.) If you boot a computer from the imaging device and you let the bootup process proceed in automatic mode, the imaging engine starts up and checks the imaging server to see if an imaging operation should be performed on the computer. If so, it performs the imaging operation and then quits. If not, it quits without doing anything. What happens next depends on how you set this parameter. If you leave it commented out or set it to No, you are prompted to remove the imaging device (if necessary) and press any key to reboot the computer to the native operating system. If you set this parameter to Yes, the computer doesn't reboot automatically but instead displays the Linux prompt, allowing you to perform additional imaging-related tasks using the Linux menu or at the command line. This is helpful if you want to do things like check the current partition information or the image-safe data before booting to the native operating system. Example: `MANUALREBOOT=YES`

Parameter	Specifies
LANGDISK	Whether to prompt for a language diskette when you boot a computer from the imaging device. Set this parameter to Yes only if the computer has a non-English keyboard and you have created a language diskette to support that keyboard as explained in the online help for the Imaging Boot Disk Creator (Zimgboot.exe) utility. If you need to support a language that's not listed in the Imaging Boot Disk Creator utility, see "Imaging Bootup Languages (Zimglang.ini)" on page 488. Example: `LANGDISK=YES`
LOADDDITIONALDRIVERS	Whether to prompt for a diskette with a /drivers directory containing additional Linux device drivers. This is a way to add drivers that might not be included, or to update existing drivers. Example: `LOADADDITIONALDRIVERS=YES` The location of the driver on the diskette depends on the type of driver. For example, a network driver would be in /drivers/kernel/drivers/net. There might also be a drivers.conf in the /drivers directory on the diskette that will be used to configure the drivers in a specific way. For more information about adding or updating drivers, see "Adding Linux Device Drivers" on page 449.

Imaging Bootup Languages (Zimglang.ini)

The zimglang.ini file defines the non-English keyboards that are supported for the imaging bootup process. You can create language diskettes for each of these languages using the Imaging Boot Disk Creator (Zimgboot.exe) utility. You can add support for additional languages to this file as explained in Chapter 41, "Setting Up Workstations for Imaging," on page 445.

Zimglang.ini is located in the zenworks\imaging folder in your ZfD installation (on the imaging server).

Using Zimglang.ini

This is a standard Windows .ini format file. Each section of the file defines the keyboard support for a single language, including the keyboard mappings, fonts, and Unicode mappings to use. For example, the German keyboard is defined like this:

```
[German]
keymap=keymaps/de.kmap.gz
Font=consolefonts/iso01.f16.psf.gz
ACM=consoletrans/iso01.acm.gz
```

You can add support for additional languages to this file as explained in Chapter 41, "Setting Up Workstations for Imaging," on page 445.

Imaging Engine (Img: Command Line and Menu)

After booting a computer from an imaging device, use the img command at the Linux bash prompt to do any of the following:

- Take an image of the computer's hard disks
- Put down an image on the computer's hard disks

- View or manipulate the computer's hard-disk partitions
- View the computer's hardware configuration or image-safe data
- Display a menu from which you can also perform all of these tasks

The imaging engine is installed to the bin folder on the imaging boot device. If the imaging boot device is diskettes or a CD, the bin folder is actually archived in the root.tgz file, which is expanded during the imaging bootup process. If the imaging boot method is Preboot Services, the imaging engine is downloaded to the computer during bootup.

Because the imaging engine is a Linux application, the command syntax is case-sensitive. The overall syntax is:

`img [mode]`

where *mode* is any of the modes described in the sections below.

NOTE: Each mode can be abbreviated to the first letter of its name. For example, `img dump` can be abbreviated `img d`.

- "Help Mode" on page 489
- "Auto Mode" on page 490
- "Make Mode" on page 490
- "Restore Mode" on page 493
- "Dump Mode" on page 496
- "Partition Mode" on page 496
- "ZENPartition Mode" on page 497
- "Information Mode" on page 498
- "Session (Multicast) Mode" on page 499

Displaying the Menu for img Commands

To access a menu from which to perform all of these tasks, enter **`img`** with no parameters.

Help Mode

Use Help mode to get information about the `img` command if you don't have this documentation available.

To use the Help mode:

1. Enter **`img`** to display a menu > select Help > a mode name.

   or

   Enter the following:

   `img [help [mode]]`

   where *mode* is the mode whose command syntax you want help with.

Example	Explanation
`img help`	Displays a short description of each mode.

Example	Explanation
`img help m`	Displays information on how to use the Make mode.
`img help p`	Displays information on how to use the Partition mode.

Auto Mode

Use Auto mode to image the computer automatically, based on any applicable NDS or eDirectory policies and settings. The imaging engine runs in this mode if you let the imaging bootup process proceed without interruption, or if you type the command below at the Linux prompt.

To use the Auto mode:

1. Enter **`img`** to display a menu > select Auto.

   or

   Enter the following:

   `img auto`

In this mode, the imaging engine queries the imaging server specified in the PROXYADDR environment variable for any work to do. The imaging server checks the relevant NDS or eDirectory policies and settings to determine what imaging tasks should be performed (if any), such as taking or putting down an image. It then instructs the imaging engine to perform those tasks. If any tasks involve storing or retrieving images on other imaging servers, the imaging server refers the imaging engine to those servers to complete those tasks. After the imaging engine has completed its work, it communicates the results to the original imaging server, and the results are logged on that server.

For information on configuring the NDS or eDirectory policies and settings that control what happens in this mode, see Chapter 42, “Setting Up Imaging Policies,” on page 457.

Make Mode

Use the Make mode to take an image of the computer and store it in a specified location. Normally, all partitions on hard disks and other storage devices (such as Jaz drives) are included in the image, but there are some exceptions noted below.

The image size will correspond roughly to the size of the data in the Windows partitions plus the entire size of any non-Windows partitions (such as NetWare partitions). Linux partitions and Compaq configuration partitions are always excluded. The data from Windows partitions is stored in an intelligent, file-by-file format so you can customize it later using the Image Explorer (Imgexp.exe) utility. Non-Windows partitions are stored in a raw, bit-by-bit format that cannot be customized.

The syntax of this mode depends on whether you will store the image locally or on an imaging (proxy) server, as explained in the subsections below:

- “Make Locally” on page 491
- “Make on Proxy” on page 492

Make Locally

Use the Make Locally mode to take an image of the computer and store it in a partition on a local (writable) device, such as a hard disk or Jaz drive. For more information, see Chapter 44, "Setting Up Disconnected Imaging Operations," on page 465.

To use the Make Locally mode:

1. Enter **`img`** to display a menu > select Make an Image > Local Image. Select the partition to store the image in, or Local Linux File System to store the image in the local ZfD Workstation Imaging (Linux) partition. Type the image path and filename. If you are using compression, select a compression option. (Optimize for Speed takes the least amount of time but creates the largest image file. Optimize for Space creates the smallest image file but might take a significant amount of time. Balanced is a compromise between compression time and image file size.) Specify any advanced parameters, such as x*partition*. If you want, specify additional information in the Description (a description of the image), Machine Name (the computer on which the image is being stored), Author (the name of the person entering this information), and Comments (any additional comments) fields.

   or

   Enter the following:

   `img makel[`*`pNumber`*`] `*`filepath`*` [comp=`*`comp level`*`] [x`*`partition`*`]`

Parameter	Specifies
makel[*pNumber*]	The partition number (as displayed by `img dump`) of the local partition to store the image in. It must be a primary FAT16 or FAT32 partition. This partition is excluded from the image that's created. If you omit the partition number from this parameter, the image is stored in the local ZfD imaging partition.
filepath	The image filename, including a .zmg extension and the complete path from the root of the partition. The directories in the path must exist. If the file already exists, it will be overwritten.
[comp=*comp level*]	*comp level* is the amount of compression used when creating the image. Specify any number from 0-9. 0 means no compression. 1 is the same as Optimize for Speed and is used by default if you do not specify this parameter. 6 is the same as Balanced. 9 is the same as Optimize for Space. See the paragraph in Step 1 on page 491 for more information.
x*partition*	The partition number (as displayed by `img dump`) of a local partition to exclude from the image. You can repeat this parameter as needed to exclude multiple partitions. If you omit this parameter, all partitions are included in the image except the one where the image will be stored.

Example	Explanation
`img makel8 /imgs/dellnt.zmg`	Takes an image of all partitions except the one in slot 8 and saves the image to imgs/dellnt.zmg in the partition in slot 8. (Assumes slot 8 contains a primary FAT16 or FAT32 partition.)
`img makel /imgs/dellnt.zmg`	Takes an image of all partitions and saves it to imgs/dellnt.zmg in the ZfD imaging partition. (Assumes the ZfD imaging partition has been installed.)
`img makel /imgs/dellnt.zmg x2 x3`	Takes an image of all partitions except those in slots 2 and 3 and saves the image to imgs/dellnt.zmg in the ZfD imaging partition. (Assumes the ZfD imaging partition has been installed.)

Make on Proxy

Use the Make on Proxy mode to take an image of the computer and store it on an imaging (proxy) server. For more information, see "Manually Taking an Image of a Workstation" on page 462.

To use the Make on Proxy mode:

1. Enter **`img`** to display a menu > select Make an Image > Proxy Image. Type the IP address or DNS name of your imaging server. Type the UNC path and filename where the new image is to be stored on the imaging (proxy) server. If you are using compression, select a compression option. (Optimize for Speed takes the least amount of time but creates the largest image file. Optimize for Space creates the smallest image file but might take a significant amount of time. Balanced is a compromise between compression time and image file size.) Specify any advanced parameters, such as x*partition*. If you want, specify additional information in the Description (a description of the image), Machine Name (the computer on which the image is being stored), Author (the name of the person entering this information), and Comments (any additional comments) fields.

   or

   Enter the following:

   `img makep` ***`address filepath`*** **`[comp=`*`comp level`*`] [x`*`partition`*`]`**

Parameter	Specifies
address	The IP address or DNS name of the imaging server to store the image on.
filepath	The image filename, including a .zmg extension and the complete path in UNC style. The directories in the path must exist. If the file already exists, the imaging server won't overwrite it unless you enable this behavior in the imaging server's policy in NDS or eDirectory. (See "Allowing Overwriting Filenames and Restricting Save Location of Image Files (Imaging Server Settings)" on page 460.) If no folders are specified in the path, the image is created at the root of the volume or drive where the ZfD Workstation Imaging server software is installed. **IMPORTANT:** Because Linux doesn't recognize backslashes, you must use forward slashes in the UNC path or enclose the entire path in quotes.
[comp=*comp level*]	*comp level* is the amount of compression used when creating the image. Specify any number from 0-9. 0 means no compression. 1 is the same as Optimize for Speed and is used by default if you do not specify this parameter. 6 is the same as Balanced. 9 is the same as Optimize for Space.
x*partition*	The partition number (as displayed by `img dump`) of a local partition to exclude from the image. You can repeat this parameter as needed to exclude multiple partitions. If you omit this parameter, all partitions are included in the image.

Example	Explanation
`img makep 137.65.95.127 //xyz_server/sys/imgs/dellnt.zmg`	Takes an image of all partitions and saves it to sys/imgs/dellnt.zmg on xyz_server. (Assumes 137.65.95.127 is the IP address of xyz_server.)
`img makep img.xyz.com //xyz_server/sys/imgs/dellnt.zmg x2 x3`	Takes an image of all partitions except those in slots 2 and 3 and saves the image to sys/imgs/dellnt.zmg on xyz_server. (Assumes img.xyz.com is the DNS name of xyz_server.)

Restore Mode

Use the Restore mode to retrieve an image from a specified location and put it down on the computer.

Normally, if the image to be put down is a base image (one created previously by the imaging engine), all existing partitions except Linux and Compaq configuration partitions are removed from all local writable devices (such as hard disks and Jaz drives) before the new image is put down. When the image is put down, the sizes of the original partitions from which the image was taken are preserved if possible. If there's insufficient space, the last partition is shrunk to fit unless this would result in data loss, in which case the imaging engine denies the requested operation. If there's extra space left after all partitions in the image have been restored to their original sizes, that space is left unpartitioned.

If the image to be put down is an add-on image (one produced from an Application object or created by the Image Explorer (Imgexp.exe) utility), or if it's a base image and you specify the a*partition*:p*partition* parameter, none of the existing physical partitions are removed. Instead, the appropriate partitions are merely updated with the files from the image. The update process does not remove any existing files or overwrite any existing files of the same names if they are newer.

NOTE: Restoring add-on images over 4 GB in size is not supported by ZfD Workstation Imaging.

The syntax of this mode depends on whether you will retrieve the image from a local device or from an imaging (proxy) server, as explained in the subsections below:

- "Restore from Local" on page 493
- "Restore from Proxy" on page 494

Restore from Local

Use the Restore from Local mode to retrieve an image from a local device and put it down on the computer. For more information, see Chapter 44, "Setting Up Disconnected Imaging Operations," on page 465.

To use the Restore from Local mode:

1. Enter **`img`** to display a menu > select Restore an Image > Local Image. Select Local Linux File System if the image is stored in the local ZfD Workstation Imaging (Linux) partition, or select the partition where the image is stored. Type the image path and filename. Specify any advanced parameters, such as s*fileset* or a*partition*:p*partition*.

   or

   Enter the following:

   `img restorel[`*`pNumber`*`] `*`filepath`*` [s`*`fileset`*`] [a`*`partition`*`:p`*`partition`*`]`

Parameter	Specifies
restorel[*pNumber*]	The partition number (as displayed by `img dump`) of the local partition to retrieve the image from. It must be a primary FAT16 or FAT32 partition. This partition will not be changed by the imaging operation. If you omit the partition number from this parameter, the image is retrieved from the local ZfD imaging partition.
filepath	The filename of the image to retrieve, including the .zmg extension and the complete path from the root of the partition.

Parameter	Specifies
s*fileset*	The number of the image fileset (variant) to put down. Valid values are 1 through 10. For information on creating variants of an image, see Chapter 45, “Preparing Images,” on page 469. If you omit this parameter, fileset 1 is used.
a*partition*:p*partition*	A mapping between a partition in the image archive (a*partition*) and a target physical partition on the local machine (p*partition*). Use this parameter to selectively restore a specific part of the image to a specific local partition. **IMPORTANT:** If you use this parameter, none of the existing local partitions are removed, and only the target local partition is updated. The update process does not remove any existing files or overwrite any existing files of the same names if they are newer. If you want to remove all existing files from the target partition before updating it, first use `img pd` and `img pc` to delete and recreate the partition. For a*partition*, use the partition number displayed for the source partition in the Image Explorer (Imgexp.exe) utility. For p*partition*, use the partition number displayed by `img dump` for the target partition. The target partition must be a Windows partition. You can repeat this parameter as needed to request multiple selective restorations in a single operation. In doing so, you can apply multiple parts of the image to a single local partition, but you can’t apply the same part of an image to multiple local partitions in a single operation.

Example	Explanation
`img restorel8 /imgs/dellnt.zmg`	Removes all existing local partitions except the one in slot 8, retrieves the image from imgs/dellnt.zmg in slot 8, and puts down the partitions and contents of that image on the available local writable devices. (Assumes there’s sufficient local space and that slot 8 contains a primary FAT16 or FAT32 partition.)
`img restorel /imgs/dellnt.zmg`	Removes all existing local partitions, retrieves the image from imgs/dellnt.zmg in the ZfD imaging partition, and puts down the partitions and contents of that image on the available local writable devices (assuming there’s sufficient space).
`img restorel /imgs/dellnt.zmg s2`	Removes all existing local partitions, retrieves the image from imgs/dellnt.zmg in the ZfD imaging partition, and puts down the partitions and contents of variant 2 of that image on the available local writable devices (assuming there’s sufficient space).
`img restorel /imgs/dellnt.zmg a2:p1 a3:p1`	Retrieves the image from imgs/dellnt.zmg in the ZfD imaging partition, updates local partition 1 with the data from partitions 2 and 3 of that image, and leaves the other local partitions unchanged. (Assumes there’s sufficient space in local partition 1.)

Restore from Proxy

Use the Restore from Proxy mode to retrieve an image from an imaging (proxy) server and put it down on the computer. For more information, see “Manually Putting an Image on a Workstation” on page 463.

To use the Restore from Proxy mode:

1. Enter **`img`** to display a menu > select Restore an Image > Proxy Image. Type the IP address or DNS name of the imaging (proxy) server. Type the UNC path and filename where the image is to be retrieved from. Specify any advanced parameters, such as s*fileset* or a*partition*:p*partition*.

or

Enter the following:

`img restorep` *`address filepath`* `[`*`sfileset`*`] [`*`apartition`*`:p`*`partition`*`]`

Parameter	Specifies
address	The IP address or DNS name of the imaging server to retrieve the image from.
filepath	The filename of the image to retrieve, including the .zmg extension and the complete path in UNC style. **IMPORTANT:** Because Linux doesn't recognize backslashes, you must use forward slashes in the UNC path or enclose the entire path in quotes.
s*fileset*	The number of the image fileset (variant) to put down. Valid values are 1 through 10. For information on creating variants of an image, see Chapter 45, "Preparing Images," on page 469. If you omit this parameter, fileset 1 is used.
a*partition*:p*partition*	A mapping between a partition in the image archive (a*partition*) and a target physical partition on the local machine (p*partition*). Use this parameter to selectively restore a specific part of the image to a specific local partition. **IMPORTANT:** If you use this parameter, none of the existing local partitions are removed, and only the target local partition is updated. The update process does not remove any existing files or overwrite any existing files of the same names if they are newer. If you want to remove all existing files from the target partition before updating it, first use the Partition Mode to delete and recreate the partition. For a*partition*, use the partition number displayed for the source partition in the Image Explorer (Imgexp.exe) utility. For p*partition*, use the partition number displayed by `img dump` for the target partition. The target partition must be a Windows partition. You can repeat this parameter as needed to request multiple selective restorations in a single operation. In doing so, you can apply multiple parts of the image to a single local partition, but you can't apply the same part of an image to multiple local partitions in a single operation.

Example	Explanation
`img restorep 137.65.95.127 //xyz_server/sys/imgs/dellnt.zmg`	Removes all existing local partitions, retrieves the image from sys/imgs/dellnt.zmg on xyz_server, and puts down the partitions and contents of that image on the available local writable devices. (Assumes there's sufficient local space and that 137.65.95.127 is the IP address of xyz_server.)
`img restorep img.xyz.com //xyz_server/sys/imgs/dellnt.zmg s2`	Removes all existing local partitions, retrieves the image from sys/imgs/dellnt.zmg on xyz_server, and puts down the partitions and contents of variant 2 of that image on the available local writable devices. (Assumes there's sufficient local space and that img.xyz.com is the DNS name of xyz_server.)
`img restorep img.xyz.com //xyz_server/sys/imgs/dellnt.zmg a2:p1`	Retrieves the image from sys/imgs/dellnt.zmg on xyz_server, updates local partition 1 with the data from partition 2 of that image, and leaves the other local partitions unchanged. (Assumes there's sufficient space in local partition 1 and that img.xyz.com is the DNS name of xyz_server.)

Dump Mode

Use the Dump mode to view information about the storage devices and partitions on the computer.

To use the Dump mode:

1. Enter **`img`** to display a menu > select Dump > select No Geometry or Show Geometry.

   or

   Enter the following:

   `img dump [geo]`

Parameter	Specifies to
dump	List the existing partitions on all local writable devices, such as hard disks and Jaz drives. For each partition, the type, size, and slot number of the partition are given. **NOTE:** Linux and Compaq configuration partitions are not listed.
geo	Display additional information about the geometry (cylinders, heads, and sectors) and capacity of each storage device, including read-only devices such as CD drives.

Example	Explanation
`img dump`	Lists the current partitions on all local writable devices.
`img dump geo`	Lists all storage devices, their geometry and capacity, and the current partitions on the writable devices.

Partition Mode

Use the Partition mode to create, delete, or activate (make bootable) a partition on the computer.

To use the Partition mode:

1. Enter **`img`** to display a menu > select Partition > select an operation. See the table below for more information.

   or

   Enter the following:

   `img p`*`operation`*

   where *operation* is one of the following:

Operation	Specifies to
pc*pNumber type* [*size*] [cluster=*clusterSize*]	Create a new partition, where: ◆ *pNumber* is the number of the partition slot (as displayed by `img dump`) to create the partition in ◆ *type* is a keyword, FAT12, FAT16, FAT32, NTFS, or Extended, or a numerical value for the partition type, for example 0x0C (hexadecimal) or 11 (decimal) If you are creating an extended partition, you can create a logical drive inside of the extended partition. See the next table for an example. ◆ *size* is a valid size for the partition type in MB If you omit this parameter, the largest valid size for the partition type is used, given the available unpartitioned space on the drive. ◆ *clusterSize* is the cluster size for an NTFS partition. This parameter is not valid for any other partition type. Don't use this parameter unless you have a specific reason to do so. It must be a power of 2 (2, 4, 8, 16, ...128). If you omit this parameter, the imaging engine uses a reasonable cluster size for the NTFS partition size. The new partition is also formatted enough to be recognizable by other operating systems, but you must put a base image in the partition before Windows can store any files in it.
pd*pNumber*	Delete the partition from slot number *pNumber*. Use `img dump` to get the slot number.
pa*pNumber*	Activate (make bootable) the partition in slot number *pNumber*. Use `img dump` to get the slot number.

Example	Explanation
`img pc1 fat16`	Creates a FAT16 partition in slot 1 using all the available unpartitioned space on the drive.
`img pc5 fat32 5671`	Creates a FAT32 partition in slot 5 using 5,671 MB on the drive.
`img pd3`	Deletes the partition from slot 3.
`img pa5`	Activates (makes bootable) the partition in slot 5. (Assumes a partition exists in that slot.)
`img pc2 extended 2500`	Creates an extended partition with a 2000 NTFS logical drive and a 500 MB FAT16 logical drive.
`img pc2 NTFS 2000 cluster=1`	
`img pc2 fat16 500`	

ZENPartition Mode

Use the ZENPartition mode to enable, disable, or remove the installed ZfD Workstation Imaging (Linux) partition.

To use the ZENPartition mode:

1. Enter **`img`** to display a menu > select ZENPartition > read the text that displays > select Continue > select an operation > OK.

   or

Enter the following:

`img zenPartition` *`operation`*

where *operation* is `enable`, `disable`, or `remove`.

2 Enter **`lilo.s`** to make this change effective.

IMPORTANT: If you remove an installed ZfD imaging partition, you must immediately restore a base image with a valid non-LILO MBR (Master Boot Record). If you do not, the computer will not be able to boot properly.

Information Mode

Use the Information mode to view the following:

- Information about the hardware devices on the computer

  This information is detected during the imaging bootup process. If the imaging engine runs in auto-imaging mode, this information is sent to the imaging server to help determine which image to put on the computer, if necessary.

- The data currently stored in the image-safe area on the computer

  This data is saved by the Imaging Agent during each Windows session to ensure that it can be restored after the computer is reimaged. If the computer is new and doesn't have Windows yet, an initial set of data is supplied from an NDS or eDirectory policy via the imaging server to the imaging engine when the first base Windows image is put down. (For more information, see "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 457.)

- Name of the base image that was last put down on the computer

To use the Information mode:

1 Enter **`img`** to display a menu > select Information > select All, Hardware, or ZISD. See the table below for details.

or

Enter the following:

`img info [zisd]`

Parameter	Specifies to
info	List the detected hardware devices on the computer, including: • CPU chipset • Video adapter • Network adapter • MAC address • Sound card • Hard drive controller • Hard disk capacity • RAM

Parameter	Specifies to
zisd	List the data currently stored in the image-safe area on the computer. The items that comprise this data are listed in "Imaging Agent (Ziswin.exe)" on page 480. In addition to the image-safe data, the last base image that was put down on the computer is also listed.

Example	Explanation
`img info`	Lists the detected hardware devices on the computer.
`img info zisd`	Lists the ZfD image-safe data currently stored on the computer and the last base image that was put down.

Session (Multicast) Mode

Use the Session (Multicast) mode to take an image of one computer and put it down on multiple other computers simultaneously over the network in a single operation without NDS/eDirectory or ZfD server involvement. For more information, see Chapter 46, "Multicasting Images," on page 475.

For multicasting to work, each participating computer must boot from an imaging device and run the imaging engine in this mode, as explained below. The computer from which the image is taken is called the *master*, and the computers that receive the image are called *participants*. (Sometimes participants are referred to as *slaves*.) Starting in ZfD 4, you can start the multicast session from the imaging server. If you start the session this way, you specify an image file for multicasting rather than a workstation as the session master.

NOTE: For multicasting to work properly, the routers and switches on the network must have multicast features configured. Otherwise, multicast packets might not be routed properly.

To use the Session (Multicast) mode:

1. Enter **`img`** to display a menu > select Multicast Session > select Master or Client. Fill in the Session Name, Number of Clients, and Timeout fields. See the table below for details.

   or

   Enter the following:

   `img session` ***`name`*** **`[master|client] [clients=`*** ***`count`*** **`[t=`*** ***`minutes`*** **`]]`**

Parameter	Specifies
name	The name of the multicast session. Each computer joining the session uses the same value for this parameter. **NOTE:** The name must be unique among concurrent multicast sessions. It is hashed by the imaging engine to produce a Class D (temporary) IP address for the multicast session. To facilitate troubleshooting (wire sniffing), all ZfD Workstation Imaging multicast addresses start with 231. For example, the session name `doug` produces the multicast address 231.139.79.72.
master|client	That this computer is the session master or a session client. If you omit this parameter, the imaging engine waits for a user on one of the computers to press `m` to designate that computer as the master, or for the imaging session to be started from the imaging server by selecting Manually Start Multicast > providing the required information > selecting Yes.

Parameter	Specifies
clients=*count*	The number of participating computers that must register with the master before imaging will begin. The option only applies for session masters. If you omit this parameter, the imaging engine waits for the master user to press `g`. After imaging has begun, any participating computers attempting to register are denied.
t=*minutes*	The number of minutes the master computer will wait for the next participant to register before starting the imaging process without reaching *count* registered participants. The option only applies for session masters. If you omit this parameter, the imaging process won't start until *count* is reached or the master user presses `g`. After that, any participants attempting to register are denied.

Example	Explanation
`img session doug`	Starts a multicast session named `doug`. Each successive computer that issues this same command before the imaging begins joins the session. Imaging doesn't start until one of the users presses `m` to designate himself as master and presses `g` to start the imaging, or the imaging session is started from the imaging server by selecting Manually Start Multicast > providing the required information > selecting Yes.
`img session doug m`	Starts a multicast session named `doug` and designates this computer as the master. Each successive computer that issues `img session doug` before the imaging begins joins the session as a participant. Imaging doesn't start until the master user presses `g`.
`img session doug c=5`	Starts a multicast session named `doug`. Each successive computer that issues `img session doug` before the imaging begins joins the session. Imaging doesn't start until one of the users presses `m` to designate himself as master, or until the imaging session is started from the imaging server by selecting Manually Start Multicast > providing the required information > selecting Yes. Five other computers must also register as participants before the session begins.
`img session doug c=5 t=20`	Starts a multicast session named `doug`. Each successive computer that issues `img session doug` before the imaging begins joins the session. Imaging doesn't start until one of the users presses `m` to designate himself as master, or until the imaging session is started from the imaging server by selecting Manually Start Multicast > providing the required information > selecting Yes. Either five other computers must register as participants or more than 20 minutes must elapse between any consecutive participant registrations, whichever occurs first, and then the session will begin.

Imaging Server (Imgserv.nlm or .dll or .dlm)

The imaging server is a software component of the ZfD server. It enables imaging clients (computers that are booted from an imaging device) to connect with the network to receive imaging services, including:

- Storage or retrieval of an image on a server
- Automatic imaging based on an NDS/eDirectory policy or setting
- Logging of the results of an imaging operation
- A multicast imaging session

The imaging server modules are located on a NetWare server in sys:\system or on a Windows server in the folder where NDS or eDirectory is installed (such as c:\novell\nds).

Using the Imaging Server

In most environments, the imaging server starts automatically when you reboot the server after installing ZfD. With NDS eDirectory 8.5 on Windows, you must start the imaging server manually as follows: from the folder where NDS is installed, double-click ndscons.exe > select the imgsrv.dlm service > click Start. You might also want to click Startup to configure the service to start automatically each time the server reboots.

Use the imaging server for the following:

- "Viewing Information About Imaging Requests" on page 501
- "Starting a Manual Multicast Session" on page 501

Viewing Information About Imaging Requests

After the imaging server has started, you can view information about the status and results of the imaging requests that it has received from imaging clients. A statistical summary of these requests is shown on the server console (NetWare) or in a window accessible from the system tray (Windows). The statistics shown on this screen are explained below. All statistics are reset to zero if you restart the imaging server.

Statistic	Specifies
Update Requests	The number of imaging requests of any kind that have been received by the imaging server since it was started. This includes requests that failed, were denied, or were referred to other imaging servers (see Client Referrals below). Information about each of these requests, such as the source, type, date/time, and results, is logged on the imaging server as explained in "Imaging Server Log (Zimglog.xml)" on page 501.
Images Sent	The number of images that the imaging server has sent to imaging clients since the imaging server was started. This includes only images that were retrieved from this imaging server. See Client Referrals below for more information.
Images Received	The number of new images that have been received and stored on the imaging server since it was started. This includes images that were received through client referrals as explained below.
Client Referrals	The number of client requests that have been referred (redirected) by the imaging server to other imaging servers since this imaging server was started. Such referrals are made only when the client is running in auto-imaging mode and the imaging server determines from NDS or eDirectory that the image to be created or retrieved is on a different imaging server. **IMPORTANT:** If a client is running in manual imaging mode and it requests to store or retrieve an image on a different imaging server, the request is denied and an error is returned to the client. Referrals are currently supported only when the client is running in auto-imaging mode.

Starting a Manual Multicast Session

On the server console (NetWare) or in a window accessible from the system tray (Windows), you can start a manual multicast session, see any sessions in progress, and delete sessions. For more information, see "Physically Visiting Each Computer" on page 477 in Chapter 46, "Multicasting Images," on page 475.

Imaging Server Log (Zimglog.xml)

Zimglog.xml is a chronological record of all the imaging requests that have been received by the imaging server since it was installed and first started, including requests merely to log information

about imaging operations serviced elsewhere. For each imaging request, the imaging server logs information such as the source, type, date/time, and results of the request.

Zimglog.xml is created on a NetWare server in sys:\system or on a Windows server at the root of the drive where NDS or eDirectory is installed (such as c:\).

Viewing the Log File

This is an XML format file. The oldest imaging request is logged at the top of the file and the most recent at the bottom. The file continues to grow unless you trim it manually (using a text editor) or delete it. It isn't cleared if you restart the imaging server.

Each imaging operation is entered in the log as a group of lines. For example, the log file shown below has two entries: one describing a successful *upload* operation and another describing a failed *download* operation. (An *upload* is the taking of a client image and storing it on the imaging server or other available (local) medium. A *download* is the retrieval of a client image from the imaging server or local medium and putting it down on the client.)

```
<ZENImageLog>

<CN=CV7PB00:C0:4F:DC:2A:B5.O=sales>
<Tree>XYZ</Tree>
<Status>Success</Status>
<Operation>Upload</Operation>
<ImageType>Base Image</ImageType>
<ImagePath>\\XYZ_SERVER\sys\imgs\dell_nt.zmg</ImagePath>
<Timestamp>Thur Nov 22 13:10:05 2001
</Timestamp>
</CN=CV7PB00:C0:4F:DC:2A:B5.O=sales>


<CN=CV7PB00:C0:4F:DC:2A:B5.O=sales>
<Tree>XYZ</Tree>
<Status>Failure</Status>
<ErrorMessage>Unable to find an image to download</ErrorMessage>
<Operation>Download</Operation>
<Timestamp>Thur Nov 22 13:13:17 2001
</Timestamp>
</CN=CV7PB00:C0:4F:DC:2A:B5.O=sales>

</ZENImageLog>
```

The table below describes the various XML elements that comprise the log entries shown above. Each element has an opening and closing tag, such as <tree> and </tree>. The outermost element contains all the other elements in the entry.

XML Element	Specifies
Outermost_Container	The distinguished NDS or eDirectory name of the workstation that requested the imaging operation. This name is read by the imaging engine from the workstation's image-safe data. If the workstation name isn't found (for example, if the workstation hasn't been registered as an object in NDS or eDirectory), the name of the imaging server that serviced the request is given instead (for example, XYZ_SERVER).
Tree	The NDS or eDirectory tree containing the workstation or server specified in the *Outermost_Container* element.

XML Element	Specifies
Status	Whether the requested imaging operation succeeded or failed.
ErrorMessage	The reason why the requested imaging operation failed, if applicable.
Operation	Whether the requested imaging operation was an upload or download attempt. An *upload* is the taking of a client image and storing it on the imaging server or other available (local) medium. A *download* is the retrieval of a client image from the imaging server or local medium and putting it down on the client. **NOTE:** Occasionally, you might see an entry in the log that omits the Operation element. Such an entry is typically a follow-up to the previous operation. For example, you might see an entry indicating that a download operation was successful, but the next entry (time-stamped a few seconds later and specifying no operation) might indicate that the imaging server failed to get image-safe data from NDS or eDirectory. In this case you could assume that the client that just received the download didn't have its own image-safe data, and so the imaging server was trying to get that data from NDS or eDirectory to apply it to the client.
ImageType	Whether the image that was created or retrieved is a base image or an add-on image. With a base image, all existing partitions and data are removed before the image is put down. With an add-on image, the existing partitions are left intact and are merely augmented with additional data.
ImagePath	The full path and filename of the image that was created, retrieved, or requested.
Timestamp	The time when the results of the requested imaging operation were logged by the imaging server, including the week day, month, date, 24-hour time (including seconds), and year.

48 Supported Ethernet Cards

The following sections list the Ethernet cards that are supported by Novell® ZENworks® for Desktops (ZfD) for performing network-connected imaging operations on workstations and laptop computers. If your workstation or laptop computer doesn't have one of these cards, you must supply your own Ethernet driver as explained in "Using Zimgboot.exe to Add Linux Drivers" on page 484.

- "Ethernet Cards for a Workstation" on page 505
- "Ethernet Cards for a Laptop Computer (PCMCIA)" on page 506

Ethernet Cards for a Workstation

The following Ethernet cards are supported for standard desktop (non-laptop) workstations:

- 3C501
- Etherlink* II, 3c503, 3c503/16
- Etherlink plus 3c505
- Etherlink-16 3c507
- Etherlink III, 3c509 / 3c509B
- 3c515
- 3c590/3c595, 3c592/3c597, 3c900/3c905/3c905B
- AMD* Lance (7990, 79C960/961/961 A, Pcnet-ISA), AT1500, HP-J2405A, HP-Vectra* On Board Ethernet, NE1500, NE2100
- AT2450, AMD 79C965 (Pcnet-32), AMD 79C970/970A (Pcnet-PCI), AMD 79C971, AMD 79C974
- HP 27245A
- HP EtherTwist*, PC Lan+ (27247, 27252A)
- HP 10/100 VG Any Lan Cards (27248B, J2573, J2577, J2585, J970, J973)
- EtherExpress*
- EtherExpress Pro/10
- EtherExpress Pro 10/100 B
- NE 1000, NE 2000
- NE2000-PCI
- Racal* Interlan ni5010, ni5210, ni6210
- SMC* ultra, SMC EtherEZ(8146)

- SMC Ultra32
- SMC 9000/ SMC 91c92/4
- SMC 91c100

Ethernet Cards for a Laptop Computer (PCMCIA)

The following Ethernet cards are supported for laptop (PCMCIA) computers:

Driver	Cards
3c589_cs	◆ 3Com* 3c589, 3c589B, 3c589C, 3c589D ◆ 3Com Megahertz 3CCE589E, 3CXE589D, 3CXE589EC ◆ Farallon* EtherWave, EtherMac
fmvj18x_cs (x86, ppc)	◆ CONTEC C-NET(PC)C ◆ Eagle NE200 Ethernet ◆ Eiger Labs EPX-10BT, EPX-ET 10BT, EPX-ET 10TZ ◆ Fujitsu* FMV-J181, FMV-J182A, FMV-J183 ◆ Fujitsu Towa LA501, FMV-1080, FM50N-183 ◆ Hitachi* HT-4840-11 EtherCard ◆ NextCom NC5310 ◆ RATOC REX-9822, REX-5588A/W, REX-R280 ◆ TDK LAC-CD02x, LAK-CD021, LAK-CD022A, LAK-CD021AX, LAK-CD021BX
nmclan_cs	◆ New Media EthernetLAN ◆ New Media LiveWire* (*not* LiveWire+)

Driver	Cards
pcnet_cs (A-D)	◆ Accton* EN2212, EN2216 EtherCard ◆ Accton SOHO BASIC EN220 ◆ Addtron Ethernet ◆ AIBrain EPCM-T ◆ Allied Telesis CentreCOM CE6001, LA-PCM, LA-PCM V2 ◆ AmbiCom AMB8002, AMB8002T, AMB8010 ◆ AnyCom* ECO Ethernet ◆ Apollo* RE450CT ◆ Argosy EN210 ◆ Arowana RE 450 Ethernet ◆ Asante* FriendlyNet (newer cards seem not to work) ◆ AST 1082 Ethernet ◆ Atelco ethernet ◆ Billionton LNT-10TB, LNT-10TN ◆ California Access LAN Adapter ◆ CeLAN* EPCMCIA ◆ CNet CN30BC, CN40BC Ethernet ◆ Compex/ReadyLINK Ethernet Combo ◆ Compex LinkPort Ethernet ◆ COMPU-SHACK BASEline Ethernet ◆ Connectware LANdingGear Adapter ◆ Corega* Ether PCC-T, PCM-T ◆ CyQ've ELA-010 10baseT ◆ Danpex* EN-6200P2 Ethernet ◆ Datatrek NetCard ◆ Dayna* Communications CommuniCard E ◆ Digital* DEPCM-AA, PCP78-AC Ethernet ◆ Digital EtherWORKS* Turbo Ethernet ◆ D-Link* DE-650, DE-660 ◆ DynaLink L10C Ethernet

Driver	Cards
pcnet_cs (E-K)	◆ Edimax Technology Ethernet Combo ◆ EFA InfoExpress 205, 207 Combo ◆ Eiger Labs EPX-ET10T2 Combo ◆ ELECOM Laneed LD-CDWA, LD-CDX, LD-CDNIA, LD-CDY, LD-CDF ◆ EP-210 Ethernet ◆ Epson* Ethernet ◆ EtherPRIME Ethernet ◆ Explorer NE-10000 Ethernet ◆ EZLink 4109 Ethernet ◆ Fiberline FL-4680 ◆ Gateway 2000* Ethernet ◆ Genius ME3000II Ethernet ◆ Grey Cell Ethernet ◆ GVC NIC-2000P Ethernet Combo ◆ Hamlet LM560 ◆ Hawking PN650TX ◆ Hypertec HyperNet ◆ IBM CreditCard Ethernet Adapter ◆ IC-Card Ethernet ◆ Infotel IN650ct Ethernet ◆ IO DATA PCLA/T, PCLA/TE ◆ Katron PE-520 Ethernet ◆ KingMax Technology EN10-T2 Ethernet ◆ Kingston* KNE-PCM/M, KNE-PC2, KNE-PC2T ◆ KTI PE-520 Plus

Driver	Cards
pcnet_cs (L-R)	◆ LANEED LD-CDW Ethernet ◆ LanPro EP4000A ◆ Lantech Ethernet ◆ Level One EPC-0100TB ◆ Linksys EtherCard, EC2T Combo ◆ Logitec* LPM-LN10T, LPM-LN10BA, LPM-LN20T Ethernet ◆ Longshine ShineNet LCS-8534TB Ethernet ◆ Macnica ME-1 Ethernet ◆ Maxtech* PCN2000 Ethernet ◆ Melco LPC-TJ, LPC-TS, LPC-T, LPC2-T ◆ Microdyne* NE4200 Ethernet ◆ Midori LANNER LT-PCMT ◆ NDC Instant-Link ◆ NEC PC-9801N-J12 ◆ Network General Sniffer* ◆ New Media LanSurfer ◆ Novell/National NE4100 InfoMover* ◆ OvisLink Ethernet ◆ Panasonic* CF-VEL211P-B ◆ Planet SmartCOM 2000, 3500, ENW-3501-T, ENW-3502-T ◆ Pretec Ethernet ◆ PreMax PE-200 Ethernet ◆ Proteon* Ethernet ◆ Psion Gold Card Ethernet ◆ Relia RE2408T Ethernet ◆ Reliasys 2400A Ethernet ◆ RPTI EP400, EP401, 1625B Ethernet

Driver	Cards
pcnet_cs (S-Z)	◆ SCM* Ethernet (*not* SMC) ◆ Sky Link Express ◆ SMC 8022 EZCard-10 ◆ Socket Communications EA LAN Adapter ◆ Socket Communications LP-E Ethernet ◆ Socket Communications LP-E CF+ Ethernet ◆ SOHOware* ND5120-E Ethernet ◆ SuperSocket RE450T ◆ Surecom* Ethernet ◆ SVEC PN605C ◆ Thomas-Conrad* Ethernet ◆ TRENDnet Ethernet ◆ Trust Ethernet Combo ◆ UNEX NexNIC MA010 ◆ Volktek NPL-402CT Ethernet
smc91c92_cs	◆ Farallon Enet ◆ Megahertz XJ10BT, XJ10BC, CC10BT Ethernet ◆ New Media BASICS Ethernet ◆ OSITECH* Four of Diamonds ◆ SMC 8020BT EtherEZ (*not* EliteCard)
xirc2ps_cs	◆ Compaq Ethernet Adapter ◆ Xircom* CreditCard CE2, CE IIps, RE-10
3c574_cs Fast Ethernet (10/100baseT) adapters	◆ 3Com 3c574TX, 3CCFE574BT, 3CXFE574BT, 3CCSH572BT, 3CXSH572BT

Driver	Cards
pcnet_cs Fast Ethernet (10/100baseT) adapters	◆ Abocom LinkMate FE1000 ◆ AnyCom ECO Ethernet 10/100 ◆ Apollo Fast Ethernet ◆ COMPU-SHACK FASTline 10/100 ◆ Corega FastEther PCC-TX ◆ D-Link DFE-650 ◆ EXP ThinLan 100 ◆ Fiberline Fast Ethernet ◆ Hamlet FE1000 10/100 ◆ IO DATA PCET/TX ◆ KTI KF-C16 ◆ Laneed LD-10/100CD ◆ Level One FPC-0100TX ◆ Linksys PCMPC100 EtherFast, PCM100H1 HomeLink 10/100 ◆ Logitec LPM-LN100TX ◆ Melco LPC2-TX ◆ Microcom* TravelCard 10/100 ◆ Micronet EtherFast Adapter ◆ NetGear FA410TXC ◆ New Media LiveWire 10/100 ◆ Planex FNW-3600T ◆ ZONET Fast Ethernet
smc91c92_cs Fast Ethernet (10/100baseT) adapters	◆ Argosy EN220 ◆ Dynalink L100C ◆ Lantech FastNet/TX ◆ Ositech Seven of Diamonds ◆ Melco/SMC LPC-TX ◆ WiseCom WC-PC400
xirc2ps_cs Fast Ethernet (10/100baseT) adapters	**NOTE:** Some of these cards seem to misbehave at either 10baseT, 100baseT, or both. The driver doesn't seem to know how to configure the transceiver correctly. ◆ Accton* Fast EtherCard-16 ◆ Compaq Netelligent 10/100 ◆ Intel EtherExpress PRO/100 16-bit ◆ Toshiba IPC5008A, Advanced Network 10/100 ◆ Xircom CreditCard CE3-100, CE3B, RE-100
3c575_cb Fast Ethernet (10/100baseT) adapters	◆ 3Com 3c575TX, 3CCFE575BT, 3CXFE575BT, 3CCFE575CT, 3CXFE575CT

Driver	Cards
epic_cb Fast Ethernet (10/100baseT) adapters	◆ Ositech Seven of Spades CardBus
tulip_cb Fast Ethernet (10/100baseT) adapters	◆ Accton EN2220 CardBus ◆ Allied Telesyn AT-2800 ◆ AmbiCom AMB8100 ◆ Apollo FE2000 ◆ Asante FriendlyNET CardBus ◆ Compex Linkport TX ◆ D-Link DFE-660TX ◆ Genius MF3000 (some might not work) ◆ Kingston KNE-CB4TX ◆ Laneed LD-10/100CB ◆ LevelOne FPC-0101TX 10/100Mbps CardBus ◆ Linksys PCMPC200 EtherFast CardBus ◆ OvisLink LFS PCM 32 ◆ SMC EZ CardBus 10/100 Ethernet (some might not work) ◆ SVEC FD606 10/100 Ethernet ◆ TDK NetworkFlyer LAK-CB100X, LAK-CB100AX CardBus ◆ UMAX Technologies UMAX250

D Documentation Updates

This section lists updates to the Workstation Imaging part of the *ZENworks for Desktops Administration* guide that have been made since the initial release of Novell® ZENworks® for Desktops 4. The information will help you to keep current on documentation updates and, in some cases, software updates (such as a Support Pack release).

The information is grouped according to the date when the *ZENworks for Desktops Administration* guide was updated and republished:

- "April 23, 2003 (Version 4 SP1/4.0.1)" on page 513

April 23, 2003 (Version 4 SP1/4.0.1)

The following updates were made to the Workstation Imaging part of the *ZENworks for Desktops Administration* guide:

Location	Change
"Imaging Boot Disk Creator (Zimgboot.exe)" on page 483	Added information in three additional headings: Using Zimgboot.exe to Create a Language Disk, Using Zimgboot.exe to Create a Utility Disk, and Using Zimgboot.exe to Create a PXE Disk.